

17

NAVSHIPS 91270

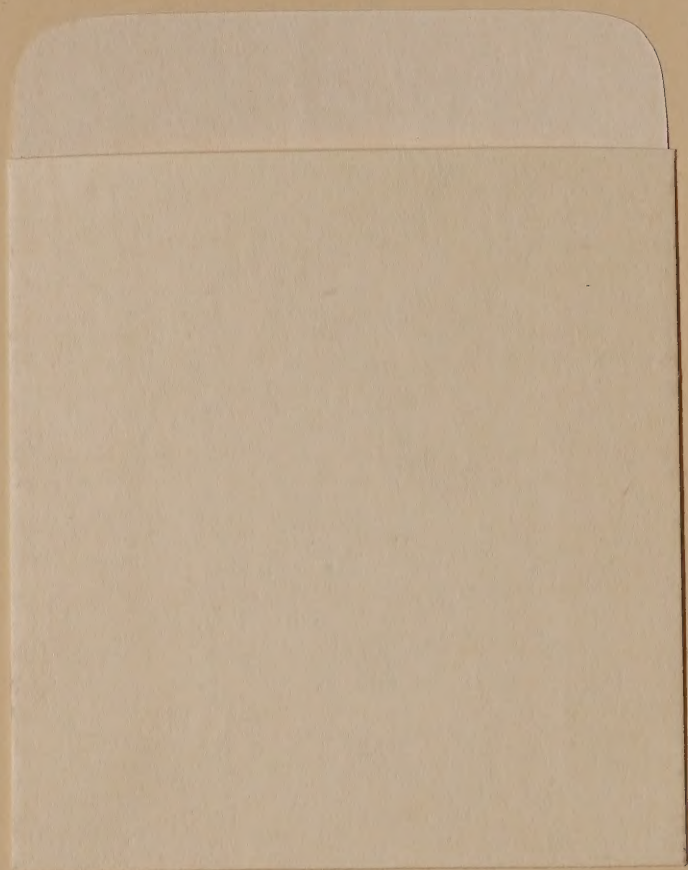
INSTRUCTION BOOK
for
RADIO RECEIVING SET
AN/URR-13

CONSISTING OF
RADIO RECEIVER R-26S/URR-13
AND ACCESSORIES

FEDERAL TELEPHONE AND RADIO CORPORATION
Clifton, New Jersey, U.S.A.

NAVY DEPARTMENT

BUREAU OF SHIPS



TEMPORARY CORRECTION T-5 TO TECHNICAL MANUAL FOR RADIO RECEIVING SET
AN/URR-13 NAVSHIPS 91270

This temporary correction changes the manual to reflect the equipment changes made by Field Change 5-AN/URR-13. The field change applies to all equipments and its purpose is to (1) replace Blower BL-301 with one which will provide adequate ventilation of the affected equipment and (2) add a connector to the blower motor leads to facilitate removal of the motor from the equipment for servicing and replacement.

Maintenance Support Activities shall make this correction in the technical manual immediately upon receipt. When this change is included in the manual the manual shall cover the equipment as though Field Change 5-AN/URR-13 had been accomplished on the equipment.

Holders of equipment accompanied by technical manuals shall not make the correction in the manual until accomplishment of Field Change 5-AN/URR-13. This correction does not supersede any other corrections or changes.

Make the following pen and ink corrections. Insert this temporary correction in the technical manual immediately after the front cover and preceding T-4.

<u>Page</u>	<u>Action</u>
iv	Add: 7-20, Blower Motor Assembly BL-301, Exploded View.
2-19	If the second sentence of paragraph 2h(5) has been deleted, the following should be added. "It is controlled by the thermostat S-301, which automatically turns on the blower motor assembly whenever the inside ambient temperature reaches 60°C."
6-3	Delete: Quarterly section, Routine Maintenance Check, Table 6-1; add "See T-5". Clean air filters monthly instead of quarterly. In shore stations or in a ship which is tied to a pier, the dust content may be high, in which case air filters must be cleaned weekly. Clean with a solution of hot water and dishwashing compound (Fed. Stk. No. GT 7930-269-1278). Let filters dry thoroughly. Dip filters in Military Symbol -2190T or -3100 lubrication oil, or equivalent (SAE30 or 50), using heavier oil (-3100 or SAE50) at higher operating temperatures. Let excess oil drain off for about 1/2 hour.
7-7	Delete the following paragraphs: paragraph 5a completely and 5b to and including 5b(1).
7-9	Delete the following paragraphs: paragraph 5b(2) to and including 5b(7).
7-8A & 7-8B	This is a new page provided with this Field Change, and is to be inserted between pages 7-8 & 7-9.

Page 8-23 Change EL-301 to read as follows:

SYMBOL DESIG- NATION	FEDERAL STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFGR. AND MFGR'S DESIG.	ALL SYMBOL DESIG. INVOLVED	NO. OF TIMES UNIT
BL-301-	BL450-289- 5961 =	Blower motor assembly; Centrifugal fan type, single unit operating on a common shaft; direct drive connection, consists of one BL-301A, one BL-301B and one BL-301C.	Cabinet cooling		BL-301	1
BL-301A	N6105-643- 1105 =	Motor, Alternating Current: Squirrel cage induction type, capacitor starting, permanent split-capacitor type; 115V, 60 cycle, single phase, 0.12 amp full load rating, 0.8 power factor; 0.0036hp, 3200 rpm; single take-off shaft, CCW rotation looking at load end; closed frame; 40 deg C rise for continuous operation; flattened shaft, 0.25 in. dia.; overall dim.; 2.6401 in. lg.-excl shaft, 2 in. dia.; shaft extends 1.0625 in. from end of enclosure; hole mtd W/3 6-32 tapped mtg holes spaced 120 deg apart on 1.281 in. dia.	p/o EL-301 AIRM AL5B-23	EL-301A		1
BL-301B	Low failure item. If req. requisition from ESO ref. NAVSHIPS 900, 180A.	Impeller, Fan. Centrifugal; Double inlet wheel; multi-blade type; forward curved blades; steel; single W/28 blades; overall dim. 2 1/2 in. dia., 1 15/32 in. wide.	p/o BL-301 Torrington 216x115	EL-301B		1
BL-301C	Low failure item. If req. requisition from ESO ref. NAVSHIPS 900, 180A.	Housing, for impeller, fan, centrifugal; welded structure which contains BL-301B, mounts BL-301A, and serves as mtg bracket for mounting complete BL-301 to chassis; overall dim. 4 11/16 in. wide, 5 3/8 in. high, 2 9/16 in. thick, W/ 1 1/2 in. sq. outlet W/deflector; type no. 6, Ref Dwg Dr. 71.	p/o EL-301	EL-301C		1

Page 8-34 ADD J-301 and P-302

SYMBOL DESIG- NATION	FEDERAL STOCK NO.	NAME OF PART AND DESCRIPTION	FUNCTION	MFGR. AND MFGR'S. DESIG.	ALL SYMBOL DESIG. INVOLVED	NO. OF TIMES IN UNIT
J301	N5935-642- 695	CONNECTOR, RECEPTACLE, ELECTRICAL; 4 contacts; 1 connector mating end; cont. data, Ref. DWG. GR. 206, Section A. PART ONE: A,B,C,D,E,F,G, 4 FL 10. N/A NR NR 125 PART TWO: H J K L N/A N/A N/A N/A low loss plastic; straight shape; over-all dim., 17/32 in. lg. x 1/4 in. hex; locking type, bayonet latch type; self mtg w/3/8 - 24 thd.	Blower motor connection	WIN MIS-LRGN	J302	1
P-302	N5955-296- 7714	CONNECTOR, PLUG, ELECTRICAL; 4 contacts; 1 connector mating end; contact data, ref. dwg. gr. 206, Section A. PART ONE: A,B,C,D,E,F,G, 4 ML 10 N/A NR NR 125 PART TWO: H J K L N/A N/A N/A N/A, low loss plastic; straight shape; over-all dim., excl term and cable clamp, 25/32 in. lg x 9/16 in. dia; locking type, bayonet latch type; w/cable clamp; p/o BL301, c/o P302A, and P302B.	Blower motor connection	WIN MIP-LSHLOC	P302	1
P302A	For ref. only	CONNECTOR PLUG, ELECTRICAL: Plug portion of P302; over-all dim. 3/4 in. lg. x 11/16 in. dia. one end 3/8 -24 thd for hood P302B; p/o P302.		WIN MIP-13	P302A	1
P302B	For ref. only	SHIELD, ELECTRICAL CONNECTOR: over-all dim. incl cable clamp, 7/8 in. lg x 9/16 in. dia. p/o P302.		WIN FLOC	P302B	1

The material on this page is to replace the indicated paragraphs in the following Technical Manual.

AN/URR-13- NAVSHIPS 91270-Section 7, paragraph 5a and 5b.

Blower motor assembly BL-301. - Blower motor assembly BL-301 is located in the right rear corner of the chassis. Its removal is simple and should be undertaken as follows:

(1) Remove the receiver chassis from its cabinet and place on the work bench with the right side toward the technician. In this position the blower motor assembly will face the technician.

(2) Unplug connector P-302 (motor lead plug) from jack J-301 in the chassis.

(3) Remove the four 8-32 x 3/8 in. binding head screws, lockwashers, and nuts permitting removal of the entire blower motor assembly.

(4) To replace the blower motor assembly follow steps (1) to (3) in reverse order.

Blower Capacitor C-304.- The blower capacitor is located underneath the blower motor assembly in the right rear corner of the chassis, and is attached to the chassis by means of a right angle mounting bracket. If the capacitor C-304 has to be replaced proceed as follows:

(1) Remove blower motor assembly from the chassis.

(2) Unsolder the wires from the two terminals of capacitor C-304.

(3) Remove the nuts from the two mounting studs on capacitor C-304.

(4) Slip out capacitor C-304.

(5) To install a new capacitor, follow steps (1) to (4) in reverse order. Making sure that the leads to C-304 are connected to their proper terminals.

BLOWER MOTOR BEARINGS - The equipments covered by these instruction books may have any one of three completely interchangeable types of blower motors all designated BL-301A. However, while the complete blower motors are interchangeable, the bearings in each motor are not. The following procedure shall be followed when bearing failure occurs, this procedure is applicable to all three types of blower motors. Refer to figure 7-20 entitled "Blower Motor Assembly BL-301, Exploded View" in Technical Manual for AN/URR-13.

(1) Remove blower motor assembly BL-301 from the receiver chassis.

(2) Remove the blower motor BL-301A from the assembly, first disconnecting connector P-302.

(3) Replace defective motor with a new motor BL-301A.

(4) Mount new motor on the assembly, and connect connector P-302 to jack J-301 on the chassis.

(5) Mount the complete assembly to the receiver chassis.

(6) Replace the receiver chassis in its proper cabinet.

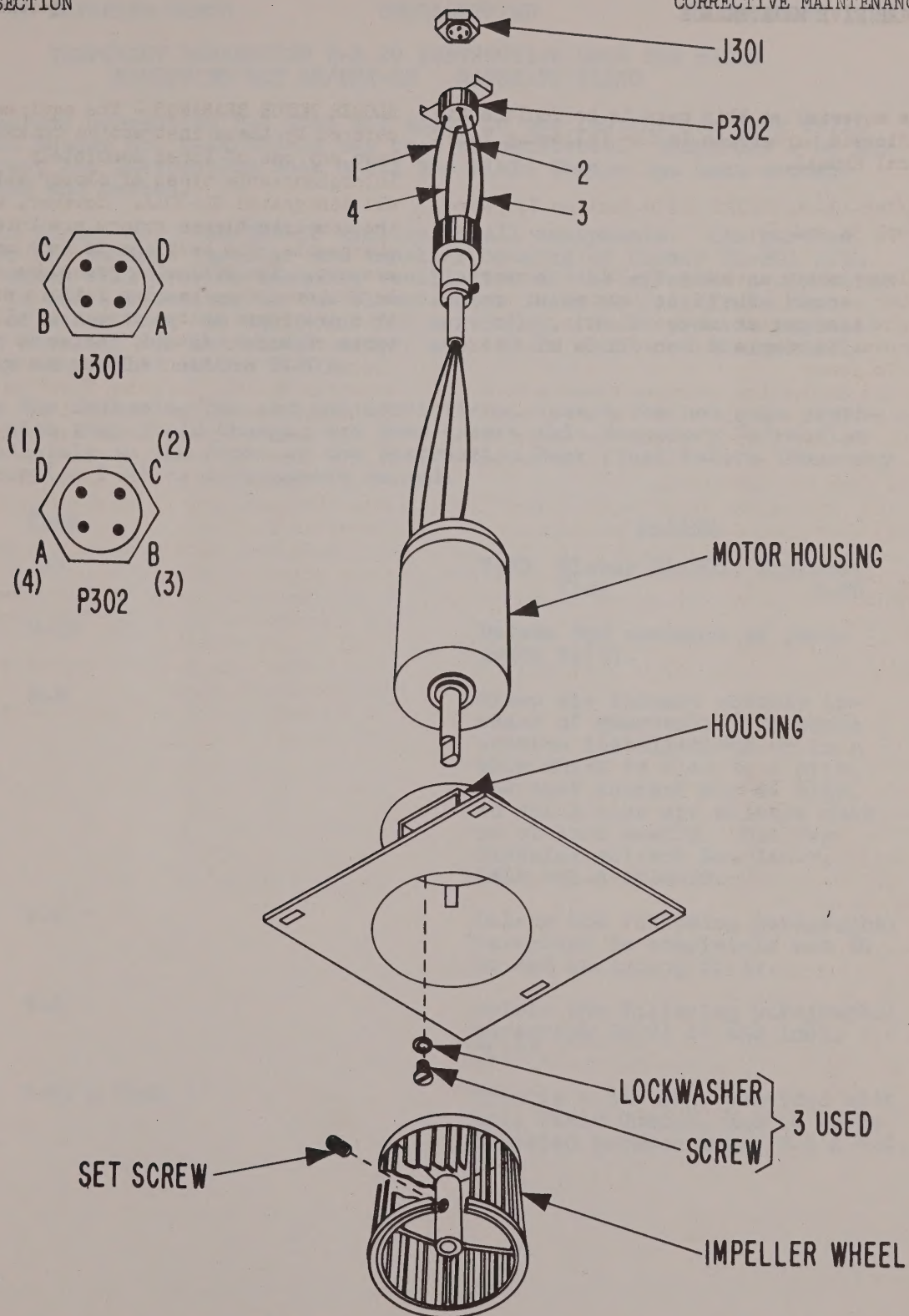


Figure 7-20

BLOWER MOTOR ASSEMBLY - BL 301, Exploded view

TEMPORARY CORRECTION T-3 TO INSTRUCTION BOOK FOR RADIO
RECEIVING SET AN/URR-13 NAVSHIPS 91270

Temporary Correction T-3 does not apply to the Instruction Book UNTIL Field Change No. 2-AN/URR-13 has been accomplished. THEREFORE - DO NOT correct the Instruction Book until the Field Change has been accomplished and tested.

Field Change No. 2-AN/URR-13 applies to all equipments. Its purpose is to (1) Replace impeller and impeller housing of blower BL-301 with one which will provide adequate ventilation of the affected equipments; (2) To add a connector to the blower-motor leads to facilitate removal of motor from the equipment for servicing; (3) To provide replacement bearings for the blower motor; and (4) To short out thermostatically controlled switch S-301.

Make the following pen and ink corrections, insert the new page provided with this Field Change, and then insert this Temporary Correction immediately in the front of the Instruction Book (just before Temporary Correction T-2) as a permanent record.

<u>Page</u>	<u>Action</u>
iv	7-20 Blower BL-301, Exploded View 7-8B
2-19	Delete 2nd sentence of paragraph 2g(5).
6-3	Clean air filters monthly instead of quarterly. In shore station installations or in a ship which is tied to a pier, the dust content may be high, in which case air filters must be cleaned weekly. Use Dry Cleaning solvent No. 140-F, SNSN G51-S-4718-10.
7-7	Delete the following paragraphs: paragraph 5a completely and 5b to and including 5b(1).
7-8	Delete the following paragraphs: paragraph 5b(2) to and incl. 5b(7).
7-8A & 7-8B	This is a new page provided with this Field Change, and is to be inserted between pages 7-8 & 7-9.

Page 8-23 Change BL-301 to read as follows:

Symb. Desig.	Name of part and description	Function	St'd Navy & Signal Corps Stock No.	Contr. dwg. & part no.	All Symbol Designation Involved	Total No. Equip.
BL-301	BLOWER, air; centrifugal vane; 35 cfm at 3300 rpm.; direct drive, counterclockwise rotation, vertical outlet toward top. Steel housing, 115 v., 60 cyc., 1 phase.	C C a o b o i l i n e n t g		Motor-Carb type J-50-4C Housing -Rois type 64275-31 Impeller-Rois type 64275-32	BL-301	1

Page 8-34 Add 0-304, 0-305, J-302, and P-302

0-304	BEARING, ball; single row radial; dble. shield; 7mm bore, 22 mm OD, 5 mm wide; 7 balls, 5/32" dia.	BL-301	N77-B-111-00702-8206	New Departure #77037 (Spec)	0-304	1
0-305	BEARING, ball; single row radial; dble. shield; 1/8" dia. bore; 3/8" OD, 5/32" wide; 7 balls, 1/16" dia.	BL-301	N77-B-115-00209-8206	New Departure #77R2 (Spec)	0-305	1
J-302	CONNECTOR, female, with bracket, 2 pin	BL-301		ELCO "Varicon" # F10220-1	J-302 P-302	1
P-302	CONNECTOR, male 2 pin, exposed ends	BL-301		ELCO "Varicon" # M1022	P-302 J-302	1

Page 8-36 Add 0-304, 0-305, J-302, and P-302

Standard	Navy Stock Number	Key Symbol
N77-B-111-00702-8206		0-304
N77-B-115-00209-8206		0-305
		J-302
		P-302

The material on this page is to replace the indicated paragraphs in the following instruction books.

- AN/URR-13 - NAVSHIPS 91270 - Section 7, paragraph 5a and 5b.
- AN/URR-13B - NAVSHIPS 91829 - Section 7, paragraph 5a and 5b.
- AN/URR-13A - NAVSHIPS 91535 - Section 7, paragraph 6a and 6b.
- AN/URR-27 - NAVSHIPS 91771 - Section 7, paragraph 6a and 6b.
- AN/URR-35 - NAVSHIPS 91906 - Section 7, paragraph 6b, 6c, and 6d.
- AN/URR-35A - NAVSHIPS 92022 - Section 7, paragraph 6b, 6c, and 6d.

BLOWER BL-301. - Blower BL-301 is located in the right rear corner of the chassis. Its removal is simple and should be undertaken as follows:

- (1) Remove the receiver chassis from its cabinet and place on work bench with the right side facing technician. In this position the blower assembly will face the operator.
- (2) Unplug connector P-302 (motor-lead plug) from jack J-302 in chassis.
- (3) Remove the four 8-32 x 3/4" binding head screws, lockwashers, and nuts permitting removal of the entire blower assembly.

BLOWER CAPACITOR C-304. - The blower capacitor is located underneath blower BL-301 in the right rear corner of the chassis, and is attached to the blower housing. If the capacitor C-304 has to be replaced follow these steps:

- (1) Remove Blower BL-301 from the chassis.
- (2) Unsolder the wires from the two terminals of capacitor C-304.
- (3) Remove the nuts from the two mounting studs on C-304.
- (4) Slip out capacitor C-304.
- (5) To install a new capacitor, reverse the above procedure, making sure that the leads to C-304 are

able, the bearings in each motor are not. The following procedure, which covers the replacement of these bearings, is applicable to all three types of blowers. Refer to figure 7-20 entitled "Blower BL-301, Exploded View," in instruction book for AN/URR-13, 13A, and AN/URR-27. Refer to figure 7-16, in instruction book for AN/URR-35 and AN/URR-35A receivers. Refer to figure 7-32 in instruction book for AN/URR-13B receivers.

- (1) Remove Blower BL-301 from the chassis.
- (2) Loosen the setscrews, holding the impeller to the motor shaft, by inserting an Allen wrench between the impeller fins, accessible through air discharge.
- (3) Remove the motor from the housing by unscrewing the three 6-32 x 1/4" steel binding head screws.
- (4) Remove the armature as follows.
 - (a) For Eastern Air Device Model J50-4C and Induction Motor Corporation Model BC-1615B-4, remove the retaining ring with a suitable pair of pliers ("Truarc" or equivalent). Withdraw the armature with its associated washers, being careful not to lose the dust cap.
 - (b) For Air-Marine Motors Model A15B-5 scribe a line across the motor housing and end bell to show proper alignment. Remove the end bell by removing the three tie bolts and lockwashers which secure it to the housing. Withdraw the armature with its associated washers. Do not lose the spring washer or dust cap.
- (5) Remove the two bearings from the armature shaft, using the bearing puller. (See Blower, BL-301, Exploded View).
- (6) Install new bearings on shaft, using an arbor press or other suitable tool (see step 5). The proper bearings for each type of blower are tabulated below; the front bearing refers to the one on the long shaft end, while the rear bearing is the one on the short shaft end of the motor.

BLOWER MFG. AND MODEL	Bearing Manufacturer, Type, Stk. No., & Symbol	
	FRONT	REAR
Eastern Air Devices J50-C	New Departure 77R4A (Spec.) N77-B-115-00412-8206	New Departure 77R2 (Spec.) N77-B-115-00209-8206
Eastern Air Devices J50-4C	New Departure 77037 (Spec.) N77-B-111-00702-8206	New Departure 77R2 (Spec.) N77-B-115-00209-8206
Induction Motor Corporation BC-1615B-4	New Departure 77037 (Spec.) N77-B-111-00702-8206	New Departure 77034 (Spec.) N77-B-111-00403-8206
Air Marine Motors A15B-5	New Departure 77R4A (Spec.) N77-B-115-00412-8206	New Departure 77R3 (Spec.) N77-B-115-00319-8206

connected to their proper terminals.

BLOWER-MOTOR BEARINGS - The equipments covered by these instruction books may have any one of three completely interchangeable types of blowers, all designated BL-301. However, while the complete blower assemblies are interchangeable,

(7) Reassemble the blower in the reverse sequence of disassembly. Be certain that the dust cap removed in step (4) (a) is properly positioned at the end of the motor.

(8) Replace the blower BL-301 on the receiver chassis following steps as outlined.

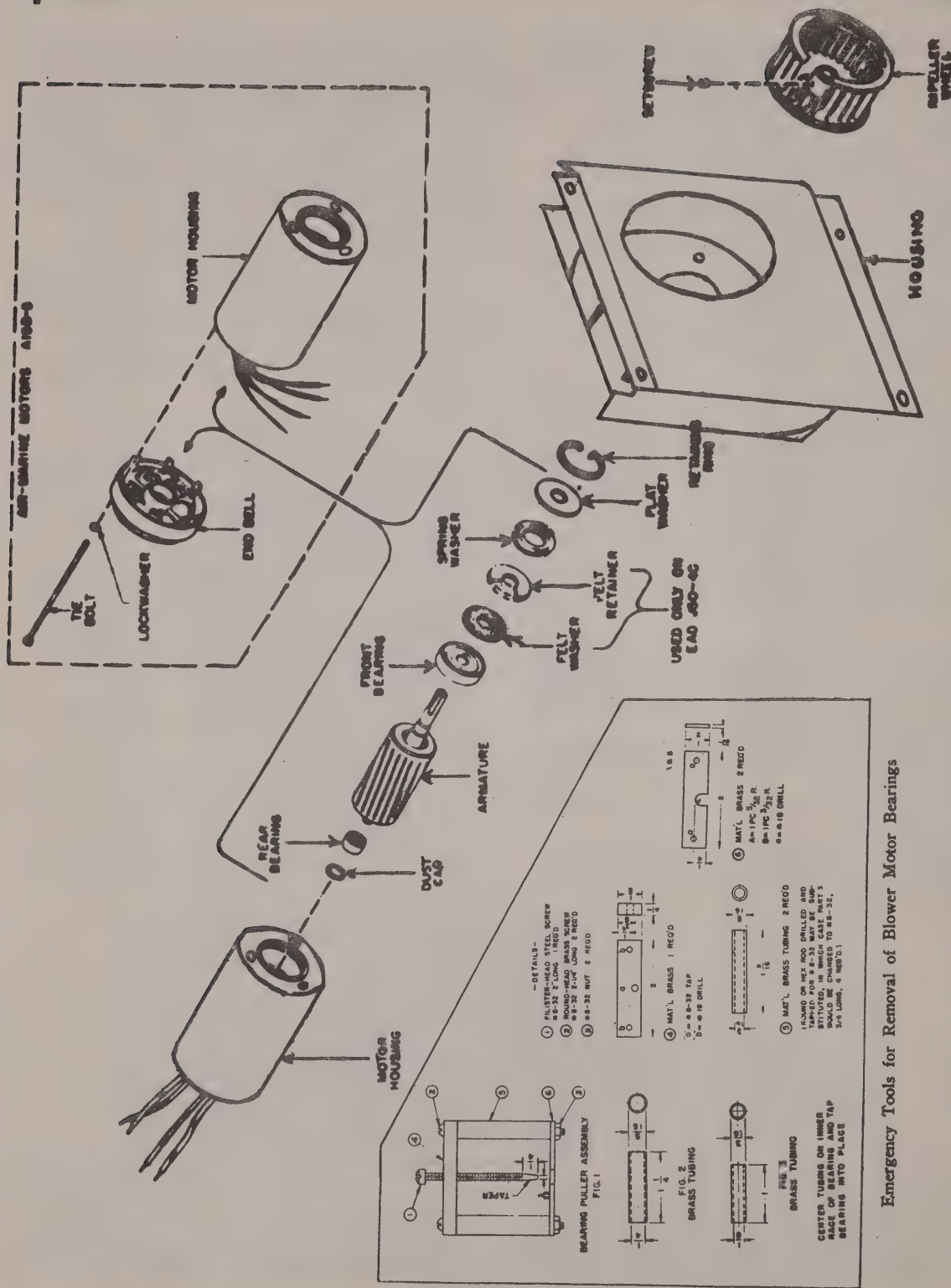
T-1 AN/URR-13B, AN/URR-27

T-2 AN/URR-35A

T-3 AN/URR-13, AN/URR-13A, AN/URR-35

AN/URR-13, AN/URR-13A, AN/URR-13B & AN/URR-27 **7-8A**

AN/URR-35 & AN/URR-35A **7-19**



Emergency Tools for Removal of Blower Motor Bearings

Figure 7-16 (AN/URR-35 & AN/URR-35A)

Figure 7-20 (AN/URR-13, AN/URR-13A, & AN/URR-27) } Blower BL-301, Exploded View

Figure 7-32 (AN/URR-13B)

7-8B AN/URR-13, AN/URR-13A, AN/URR-13B & AN/URR-27

7-20 AN/URR-35 & AN/URR-35A

T-1 AN/URR-13B, AN/URR-27

T-2 AN/URR-35A

T-3 AN/URR-13, AN/URR-13A, AN/URR-35

TEMPORARY CORRECTION T-4 TO INSTRUCTION BOOK FOR RADIO
RECEIVING SET AN/URR-13 NAVSHIPS 91270

Temporary Correction T-4 does not apply to the Instruction Book UNTIL Field Change No. 4 - AN/URR-13 has been accomplished. THEREFORE - DO NOT correct the Instruction Book until the Field Change has been accomplished and tested.

Field Change No. 4 - AN/URR-13 applies to all equipments. Its purpose is to protect the feed-through capacitors in the preselector when the receiver is removed or replaced in its cabinet.

Make the following pen and ink corrections and then insert this Temporary Correction immediately in the front of the Instruction Book (just before Temporary Correction T-3) as a permanent record.

1. Add the following sentence behind the titles of the listed illustrations.

"(Protective shield on preselector removed.)"

Add on pages:

Page 1-4, fig. 1-4	Page 7-2, fig. 7-2	Page 7-8, fig. 7-8
Page 1-5, fig. 1-5	Page 7-2, fig. 7-3	Page 7-20, fig. 7-15
Page 3-14, fig. 3-10	Page 7-4, fig. 7-4	

2. Add the following on page 8-34:

Symbol Desig.	Name of part & Description	Function	SNSN	Contr. dwg. & part no.	All symb. design involved	Qty. per equipment
None	Top shield	Protection of Preselector (top)	none	Rois 71086-31	none	1
None	Bottom shield	Protection of Preselector (bottom)	none	Rois 71086-32	none	1

TEMPORARY CORRECTION T-2 TO INSTRUCTION BOOK FOR RADIO
RECEIVING SET AN/URR-13 (NAVSHIPS 91270)

This Temporary Correction T-2 is identical to Temporary Correction T-1 (not dated), T-1 should be destroyed. However, do not destroy Temporary Correction T-1 dated 16 January 1952.

The following text material should be corrected, with pen and ink as follows:

The following warning statement should be inserted at the top of page 7-5, with arrows leading to the end of paragraph 4d (3):

WARNING

High D-C potential is present on plate capacitor and inductance trimmer screws (See figures 7-4, 7-8, and 7-9). Use only the insulated alignment tool (H201 in figure 1-4) when adjusting these trimmers.

TEMPORARY CORRECTION T-1

to

INSTRUCTION BOOK FOR RADIO RECEIVING SET AN/URR-13, NAVSHIPS 91270

and

TEMPORARY CORRECTION T-2

to

INSTRUCTION BOOK FOR RADIO RECEIVING SET AN/URR-13A, NAVSHIPS 91535

*Contracts and Unit Serial Numbers**Equipments Affected*

NObsr-43176 (Serial Nos. 1-1631)	}	All units modified by Field Change #1-AN/URR-13, #1/AN/URR-13A (NAVSHIPS 98342).
NObsr-52051 (Serial Nos. 1-507)		
NObsr-52051 (Serial Nos. 508-756)	}	All Units.
NObsr-57235 (Serial Nos. 757-2313)		
NObsr-52304 (Serial Nos. 2314-3869)		

CORRECTIONS AND CHANGES

<i>Page</i>	<i>Item</i>	<i>Page</i>	<i>Item</i>
1-7	Resistor R126 has been added, in series with the plate of the first doubler tube, V106, and transformer L115, to suppress a tendency toward spurious oscillation exhibited by some receivers. That portion of figure 1-8 showing oscillator-first doubler assembly Z101 illustrates the assembly before the change was made.		obtained from a 150-volt regulated source through decoupling resistor R125, which is bypassed for radio frequency by capacitor C123."
2-6	Add resistor R126 to the Simplified Schematic Diagram, figure 2-5, by showing this 10-ohm resistor connected in series with pin 6 of V106B (the first doubler in the oscillator-multiplier section) and the top end of the primary of its associated transformer, L115.	7-35	Add resistor R126 to figure 7-17, Overall Schematic Diagram, following the instructions given above for page 2-6.
2-7	Change the third sentence on this page to read: "Plate voltage is applied through the untuned primary of bifilar-wound transformer L115 and parasitic suppression resistor R126; voltage is	8-31	Supplement the information given for R112 as follows: Add R126 to the column headed "All Symbol Designations Involved" and change the figure in the "Total No. Per Equip." column from 1 to 2.
		8-32	After R125 add information for R126 as follows: Symbol Desig. R126; Name of Part and Description, Same as R112; Function, Damping (1st dblr).

NAVSHIPS 91270

★

INSTRUCTION BOOK

for

RADIO RECEIVING SET
AN/URR-13

CONSISTING OF

RADIO RECEIVER R-266/URR-13
AND ACCESSORIES

FEDERAL TELEPHONE AND RADIO CORPORATION
CLIFTON, N.J., U.S.A.

BUREAU OF SHIPS

NAVY DEPARTMENT

★

Contract NObsr 43176

Approved by BuShips 15 November 1949

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4-0 to 4-2	Original
A-C	Original	5-1 to 5-2	Original
i to vii	Original	6-1 to 6-3	Original
1-1 to 1-12	Original	7-1 to 7-36	Original
2-1 to 2-20	Original	8-1 to 8-38	Original
3-1 to 3-15	Original	i-1 to i-6	Original

ADDRESS NAVY DEPARTMENT
BUREAU OF SHIPS

NAVY DEPARTMENT
BUREAU OF SHIPS
WASHINGTON 25, D.C.

15 November 1949



REFER TO FILE NO.

Code 993-100

RESTRICTED

To: All Activities Concerned with the Installation,
Operation and Maintenance of the Subject Equip-
ment.

Subj: Instruction Book for Radio Receiving Set AN/URR-13
(NAVSHIPS 91270).

1. NAVSHIPS 91270 is the instruction book for the sub-
ject equipment and is in effect upon receipt.
2. NAVSHIPS 91270 is a RESTRICTED non-registered
publication and shall be handled, transported, and safe-
guarded in accordance with U. S. Navy Regulations. When
superseded by a later edition, this publication shall be
destroyed.
3. Any person known to be in the service of the United
States and persons of undoubted loyalty and discretion who
are cooperating in government work may have access to this
publication. However, information contained herein shall
not be communicated to the public or to the press.
4. This document contains information affecting the na-
tional defense of the United States within the meaning of the
Espionage Act, 50 U. S. C., 31 and 32, as amended. Its trans-
mission or the revelation of its contents in any manner to an
unauthorized person is prohibited by law. (ART. 76 U. S. N.
REGS-1920).
5. Extracts from this publication may be made to facil-
itate the preparation of other Navy instruction books and
handbooks.
6. All requests for NAVSHIPS Electronics Publications
should be directed to the nearest District Publications and
Printing Office. When changes or revised books are distrib-
uted, notice will be included in the applicable maintenance
bulletin and the BUSHIPS ELECTRON.

D. H. CLARK
Chief of Bureau

FROM BUREAU OF SHIPS

RECORD OF CORRECTIONS MADE

[illegible]

TABLE OF CONTENTS

SECTION 1. GENERAL DESCRIPTION

Paragraph	Page
1. Introduction.....	1-1
2. Description.....	1-1
a. Purpose.....	1-1
b. Basic Principles Of Operation.....	1-1
c. Equipment Arrangement.....	1-1
3. Description of Major Sub-Assemblies.....	1-6
a. Cabinet.....	1-6
b. Front Panel and Chassis Frame Assembly.....	1-6
c. Preselector Section.....	1-6
d. Dial Drive Assembly.....	1-7
e. IF/AF Section.....	1-9
f. Power Supply Section.....	1-9
g. Cable Filter Assembly.....	1-9
4. Associated Equipment.....	1-9
a. Antenna.....	1-9
b. Antenna Transmission Line.....	1-9
c. Scan Circuit.....	1-9
d. Phones and Speaker.....	1-9
e. Crystals.....	1-11
5. Reference Information.....	1-11
a. Reference Data.....	1-11
b. Electrical Characteristics.....	1-11

SECTION 2. THEORY OF OPERATION

1. General Principles.....	2-1
2. Detailed Circuit Analysis.....	2-1
a. Preselector.....	2-1
(1) R-F Amplifier Section.....	2-1
(a) Antenna Input.....	2-1
(b) Tuning Capacitor Assembly.....	2-1
(c) First R-F Amplifier.....	2-5
(d) Second R-F Amplifier.....	2-5
(e) Mixer.....	2-5
(2) Oscillator-Multiplier Section.....	2-7
(a) Oscillator-First Doubler.....	2-7
(b) Second Doubler.....	2-7
(c) Tripler.....	2-9
b. I-F Amplifier Stages.....	2-9
(1) First I-F and Scan Channel Amplifier.....	2-9
(2) Second, Third, Fourth, and Fifth I-F Amplifiers.....	2-9
(3) Input Meter Circuit.....	2-13
c. Second Detector.....	2-13
d. Noise Limiter.....	2-13

Paragraph	Page
e. AVC Rectifier.....	2-13
f. Silencer.....	2-14
g. Audio Frequency Circuits.....	2-15
b. Power Supply.....	2-19
(1) Filament and Heater Supply.....	2-19
(2) Plate and Screen Supply.....	2-19
(3) Bias Voltage.....	2-19
(4) Primary Circuit.....	2-19
(5) Blower and Thermostat.....	2-19

SECTION 3. INSTALLATION AND INITIAL ADJUSTMENTS

1. Installation Drawings.....	3-1
2. Unpacking The Equipment.....	3-1
a. General.....	3-1
b. Reinstallation of Rectifier Tube.....	3-3
c. Mechanical Check.....	3-3
3. Installation.....	3-3
a. Location of Equipment.....	3-3
(1) Table or Bench Mounting.....	3-3
(2) Relay Rack Mounting.....	3-3
b. External Connections.....	3-3
c. Preparation for Operation.....	3-5
(1) General.....	3-5
(2) Crystal Controlled Tuning.....	3-6
(3) Manually Controlled Tuning.....	3-9
(4) Scan Output.....	3-9

SECTION 4. OPERATION

1. Preliminary.....	4-0
2. Controls Provided and Their Locations.....	4-0
3. Modes of Operation.....	4-0
a. Manually-Controlled Tuning.....	4-0
b. Crystal-Controlled Tuning.....	4-0
4. Operating the Receiver.....	4-0
a. Preparation for Operation.....	4-0
b. Crystal-Controlled Tuning.....	4-1
c. Silencer Operation.....	4-1
d. Noise Limiter Circuit.....	4-2
e. Manually-Controlled Tuning.....	4-2
f. Input Meter M501.....	4-2

SECTION 5. OPERATOR'S MAINTENANCE

1. General.....	5-1
2. Routine Operational Check Charts.....	5-1

<i>Paragraph</i>	<i>Page</i>
3. Emergency Maintenance.....	5-1
a. General.....	5-1
b. Fuse Information.....	5-1
c. Electron Tube Information.....	5-2
d. Re-adjustment of Silencer Circuit Potentiometer R254.....	5-2

SECTION 6. PREVENTIVE MAINTENANCE

1. General.....	6-1
2. Overall Inspection.....	6-1
3. Routine Maintenance Check Charts.....	6-1
4. Lubrication.....	6-3
5. Re-Tropicalization.....	6-3

SECTION 7. CORRECTIVE MAINTENANCE

1. Introduction.....	7-1
2. Trouble Shooting.....	7-1
a. General.....	7-1
b. Trouble Shooting Charts.....	7-1
c. Voltage and Resistance Measurements.....	7-1
3. Electron Tube Information.....	7-1
a. Tube Data.....	7-1
b. Tube Checking.....	7-1

<i>Paragraph</i>	<i>Page</i>
4. Alignment Procedures.....	7-3
a. Equipment Required.....	7-3
b. Preparation of the Receiver for Alignment.....	7-3
c. Alignment of the I-f Section of the Receiver.....	7-3
d. Alignment of the R-f Section of the Receiver (Preselector).....	7-4
e. Alignment of Preselector if Align- ment Point Crystals are not Available.....	7-6
5. Removal and Replacement of Parts.....	7-7
a. Blower BL301.....	7-7
b. Blower Capacitor C304.....	7-7
c. Power Transformer T301.....	7-9
d. Dial Drive Assembly.....	7-11
e. Preselector.....	7-11
6. Replacement of R-f Cables.....	7-12

**SECTION 8. REPAIR PARTS LISTS
AND MISCELLANEOUS TABLES****INDEX**

LIST OF ILLUSTRATIONS

SECTION 1. GENERAL DESCRIPTION

Figure	Title	Page
1-1.	Photo—Radio Receiving Set, AN/URR-13 Complete, Including Radio Receiver R-266/URR-13, Brackets, Plugs and Instruction books.....	1-0
1-2.	Photo—Front View, Shock Mounts Attached, Relay Rack Mounting Brackets Removed.....	1-2
1-3.	Photo—Rear View (from below) Showing A.C. Power, Scan, Ant. and Audio Connectors on Underside of Band Suppression Filter F-89/URR-13.....	1-2
1-4.	Photo—Top View of Chassis.....	1-4
1-5.	Photo—Bottom View of Chassis.....	1-5
1-6.	Photo—Chassis with Preselector Removed; Left Side View.....	1-6
1-7.	Photo—Socket Plate and Shield Assemblies from R-f Amplifier Section of Preselector.....	1-8
1-8.	Photo—Socket Plate and Shield Assemblies from Oscillator - Multiplier Section of Preselector.....	1-8
1-9.	Photo—Ganged Capacitor (C102) from Oscillator-Multiplier Section of Preselector.....	1-10
1-10.	Photo—Ganged Capacitor (C101) from R-f Amplifier Section of Preselector.....	1-10
1-11.	Photo—Rear View showing Band Suppression filter F-89/URR-13, with Filter Housing Removed.....	1-11

SECTION 2. THEORY OF OPERATION

2-1.	Block Diagram—Radio Receiver R-266/URR-13.....	2-2
2-2.	Simplified Schematic—R-f Amplifier Section of Preselector.....	2-3
2-3.	Photo—Preselector from Left Side of Chassis, Shielding Covers Removed.....	2-4
2-4.	Photo—Preselector from Bottom of Unit, Shielding Covers Removed.....	2-6
2-5.	Simplified Schematic—Oscillator-Multiplier Section of Preselector.....	2-8
2-6A.	Photo—Underside of IF/AF Section (all components but resistors identified).....	2-10
2-6B.	Photo—Underside of IF/AF section (only resistors identified).....	2-11
2-7.	Simplified Schematic 1st I-F and Scan Channel Amplifier.....	2-12

Figure	Title	Page
2-8.	Simplified Schematic—Typical I-F Amplifier.....	2-12
2-9.	Simplified Schematic—Input Meter Circuit (M501).....	2-14
2-10.	Simplified Schematic—Second Detector and Noise Limiter.....	2-15
2-11.	Simplified Schematic—AVC Rectifier Circuit.....	2-16
2-12.	Simplified Schematic—Noise Silencer Circuit.....	2-16
2-13.	Simplified Schematic—Audio Frequency Circuits.....	2-17
2-14.	Simplified Schematic—Power Supply Section.....	2-17
2-15.	Photo—Underside of Power Supply Section.....	2-18
2-16.	Simplified Schematic—Band Suppression Filter F-89/URR-13.....	2-20

SECTION 3. INSTALLATION AND INITIAL ADJUSTMENTS

3-1.	Diagram—Method of Packing Radio Receiving Set, AN/URR-13.....	3-2
3-2.	Photo—Front View, Shock Mounts Removed, Relay Rack Mounting Brackets Attached.....	3-4
3-3.	Photo—View into Cabinet Showing Front of Band Suppression Filter F-89/URR-13, and Method of Attachment of Same to Cabinet.....	3-4
3-4.	Diagram—Locations of Connectors, and of I-f and R-f Cables.....	3-6
3-5.	Diagram—Method of Assembly of R-f Cable.....	3-7
3-6.	Diagram—Method of Assembly of R-f Cable.....	3-8
3-7.	Outline Drawing—Relay Rack Mounting Brackets.....	3-9
3-8.	Outline Drawing—Repair Parts Box.....	3-10
3-9.	Outline Drawing—Radio Receiver R-266/URR-13.....	3-11
3-10.	Outline Drawing—Preselector.....	3-13
3-11.	Outline Drawing—Band Suppression Filter F-89/URR-13.....	3-15

SECTION 4. OPERATION

4-1.	Photo—Front Panel, Doors Open.....	4-1
------	------------------------------------	-----

SECTION 5. OPERATOR'S MAINTENANCE

Figure	Title	Page
5-1.	Photo—Right Side Detail Showing Method of Removal of Chassis from Cabinet.....	5-2

SECTION 6. PREVENTIVE MAINTENANCE

6-1.	Details—Dial Drive Mechanism for Pre-selector, Showing Automatic Stop Device.....	6-2
------	---	-----

SECTION 7. CORRECTIVE MAINTENANCE

7-1.	Failure Reports Form (NBS-383).....	7-0
7-2.	Photo—Bench Set-up for Alignment of R-f Section of Receiver.....	7-2
7-3.	Photo—Bench Set-up for Alignment of I-f Section of Receiver.....	7-2
7-4.	Photo—Preselector from Top of Chassis Showing Alignment Adjusting Screws..	7-4
7-5.	Chart—Audio Response Characteristics..	7-6
7-6.	Chart—I-f Selectivity Characteristic.....	7-6
7-7.	Details—Trimmer Inductances L103, L104, L107, L108, L111 and L112 (Preselector).....	7-7

Figure	Title	Page
7-8.	Photo—Preselector from Bottom of Chassis Showing Alignment Adjusting Screws.....	7-8
7-9.	Photo—Preselector from Left Side of Chassis Showing Alignment Adjusting Screws.....	7-10
7-10.	Details—R-f Cables Used in or with Radio Receiving Set AN/URR-13.....	7-12
7-11.	Details—R-f Connectors Used in or with Radio Receiving Set AN/URR-13.....	7-13
7-12.	Tube Socket Diagrams—Preselector.....	7-14
7-13.	Tube Socket Diagrams—Power Supply Section	7-14
7-14.	Tube Socket Diagrams—IF/AF Section	7-18
7-15.	Voltage Diagram—Significant Voltage Measurements at Points on Preselector	7-20
7-16.	Outline & Data—Crystal Unit CR-24/U.....	7-22
7-17.	Schematic (Overall)—Radio Receiver R-266/URR-13.....	7-31
7-18.	Wiring Diagram—Receiver Chassis & Band Suppression Filter F-89/URR/13.....	7-33
7-19.	Wiring Diagram—Preselector.....	7-35

LIST OF TABLES**SECTION 1. GENERAL DESCRIPTION**

1-1.	Equipment Supplied.....	1-3
1-2.	Equipment and Publications Required but Not Supplied.....	1-3
1-3.	Shipping Data.....	1-3
1-4.	Electron Tube Complement.....	1-7

SECTION 3. INSTALLATION AND INITIAL ADJUSTMENTS

3-1.	List of Installation Drawings.....	3-1
3-2.	Connectors (Plugs) Supplied with AN/URR-13 Equipment, for Making External Connections.....	3-5

SECTION 4. OPERATION

4-1.	Typical Input Meter Calibration.....	4-2
------	--------------------------------------	-----

SECTION 5. OPERATOR'S MAINTENANCE

5-1.	Routine Operational Check Chart.....	5-1
------	--------------------------------------	-----

SECTION 6. PREVENTIVE MAINTENANCE

6-1.	Routine Maintenance Check Charts.....	6-1
------	---------------------------------------	-----

SECTION 7. CORRECTIVE MAINTENANCE

7-1.	Typical Voltage Readings (D.C.) at alignment Test Points.....	7-5
------	---	-----

7-2.	Audio Test Data.....	7-9
7-3.	Intermediate Frequency Test Data.....	7-9
7-4.	Trouble Shooting Chart.....	7-15
7-5.	Voltage and Resistance Measurements— from Electron Tube Terminals to Ground and/or Other Significant Points	7-17
7-6.	Voltage and Resistance Measurements— from Terminal Board Connections to Ground and/or Other Significant Points	7-21
7-7.	Electron Tube Characteristics.....	7-23
7-8.	Winding Data—All Wire-wound Components except Resistors.....	7-24

SECTION 8. REPAIR PARTS LISTS AND MISCELLANEOUS TABLES

8-1.	Weights and Dimensions of Repair Parts Boxes.....	8-1
8-2.	Shipping Weights and Dimensions of Repair Parts Boxes.....	8-1
8-3.	List of Major Units.....	8-1
8-4.	Combined Parts and Repair Parts List	8-2
8-5.	Cross-Reference Parts List.....	8-35
8-6.	Applicable Color Codes and Miscellaneous Data.....	8-37
8-7.	List Of Manufacturers.....	8-38

CONTRACTURAL GUARANTEE

Applicable to Radio Contract NObsr-43176,
Receiving Set, AN/URR-13 Dated 6 Jan. 1949

RADIO ONE YEAR GUARANTEE: The equipment including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to, and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government, provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period, and the Contractor is notified thereof in writing within a reasonable time, and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing condition, against defect in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total

quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObrs-43176

Date of Contract 6 Jan. 1949

Serial Number of Equipment.....

Date of Acceptance by the Navy.....

Date of Delivery to Contract Destination.....

Date of Completion of Installation.....

Date Placed in Service.....

Blank spaces in this book shall be filled in at time of installation.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIP NBS-383 (revised). The report shall cover all details of the failure and give

the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the "Bureau of Ships Manual", or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Standard Navy stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate standard Navy stock number is

not available, the following shall be specified.

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of Bureau of Ships Manual or superseding instructions on the subject of "Radio-Safety Precautions To Be Observed."

This equipment employs voltages which are dangerous, and which may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors.

To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE.

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS.

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door or safety interlock switch be removed, short circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR OR SONAR ENCLOSURE, POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

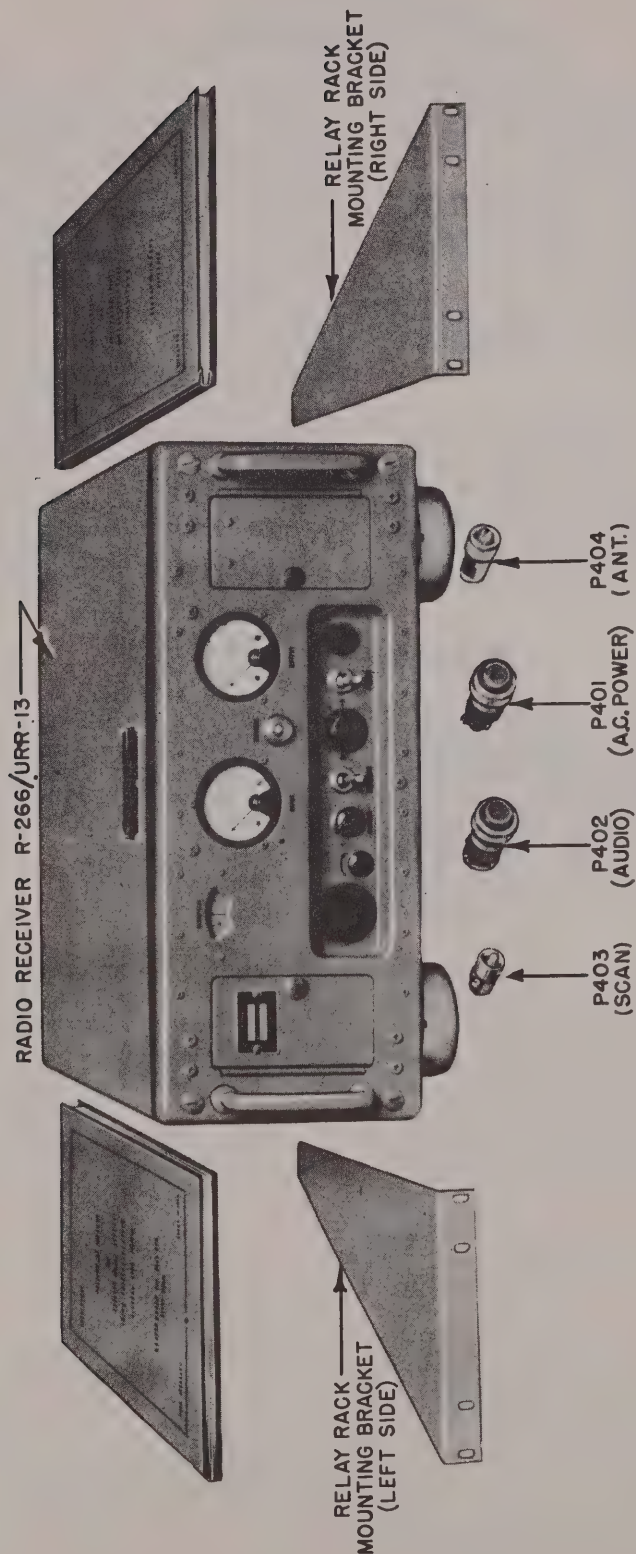


Figure 1-1. Radio Receiving Set AN/URR-13 Complete, Including Radio Receiver R-266/URR-13, Brackets, Plugs and Instruction Books

SECTION 1

GENERAL DESCRIPTION

1. INTRODUCTION.

This instruction book describes the circuit theory, installation, operation and maintenance of Radio Receiving Set AN/URR-13.

2. DESCRIPTION.

a. PURPOSE.—Radio Receiving Set AN/URR-13 is designed to provide means for reception of amplitude modulated (AM) voice and MCW transmission in the 225-400 megacycle frequency range. The receiver may be used on Naval vessels, at Naval air and shore radio stations or at other units of the military establishment.

b. BASIC PRINCIPLES OF OPERATION.—Radio Receiving Set AN/URR-13 is a VHF/UHF super-heterodyne type of receiving equipment, designed primarily for operation as a pretuned, single-channel, crystal-controlled receiver. By employing a suitable crystal any channel within the frequency range of the receiver may be selected. Provisions are also made for continuously variable manual tuning. A single tuning control is employed for tuning to any frequency for either crystal-controlled or manual tuning operation. Either one of these two methods of operation may be selected by means of the panel-mounted CRYSTAL-MANUAL switch.

Provisions are made for connecting a panoramic type radio receiver, to provide a visual picture of the received signal. The scanning channel has a band width of 600 kc, flat to within 6db.

The receiver has a sensitivity of better than 8 microvolts for a 10 db signal-to-noise ratio. An intermediate frequency of 18.6 megacycles is employed. The balanced push-pull circuit arrangement of the r-f amplifier and oscillator-multiplier circuits provides for stable operation and freedom from spurious radiation from the receiver antenna.

All power necessary for operation of the equipment is obtained from a built-in power supply which can be adjusted to operate from a 110-, a 115- or a 120-volt, 50-60 cps, single-phase, source. The audio and power source connections to the receiver are filtered to limit possible radio-frequency interference.

c. EQUIPMENT ARRANGEMENT.—Radio Receiving Set AN/URR-13 is shown complete in figure

1-1. It consists of the receiver proper (Radio Receiver R266/URR-13), a pair of auxiliary angle brackets for relay rack mounting, four plugs mating with receptacles on the receiver for use on cords to external connections and two copies of the instruction book. The receiver proper consists of a panel, frame and chassis assembly housed in a cabinet fitted with shock mounts. The equipment may be mounted on a bench or other firm horizontal surface, or (by attaching brackets) on a standard 19-inch relay rack.

The circuit components are grouped, on a functional basis, into five major sections, namely; the preselector, IF/AF, power supply, cable filtering and front panel sections. The first three sections are assembled within the chassis frame, and the front panel section is attached to the front of this frame. The cable filtering section (Band Suppression Filter F-89/URR-13) is mounted against the rear wall of the cabinet. The preselector section consists of the r-f amplifier-converter and the oscillator-multiplier sub-sections. The ganged tuning capacitors in the two sub-sections are geared together through a common dial drive assembly. The receiver is tuned by means of a single front-panel tuning control.

All primary operating controls and the meters, are mounted on the front panel. The crystal, the fuses and those controls which require only periodic change for operational adjustment are in panel compartments accessible through hinged doors. The location of the panel-mounted controls are shown in figure 4-1. Trimmer adjustment controls are readily accessible when the chassis assembly is removed from the cabinet. Trimmer adjustments in the r-f amplifier and oscillator-multiplier sections are accessible through holes located in the casting walls and in the top cover shields of the preselector unit. Trimmer adjustments for circuits in the i-f section are located at the top (accessible through holes in the shields) and bottom of the i-f transformer assemblies. Cable connections to and from the receiver are made to connectors on the underside of the cable filtering section attached to the rear of the cabinet. A phone jack is available on the front panel.

The equipment is supplied with full complement of tubes and fuses installed. The tube complement is summarized in table 1-4.

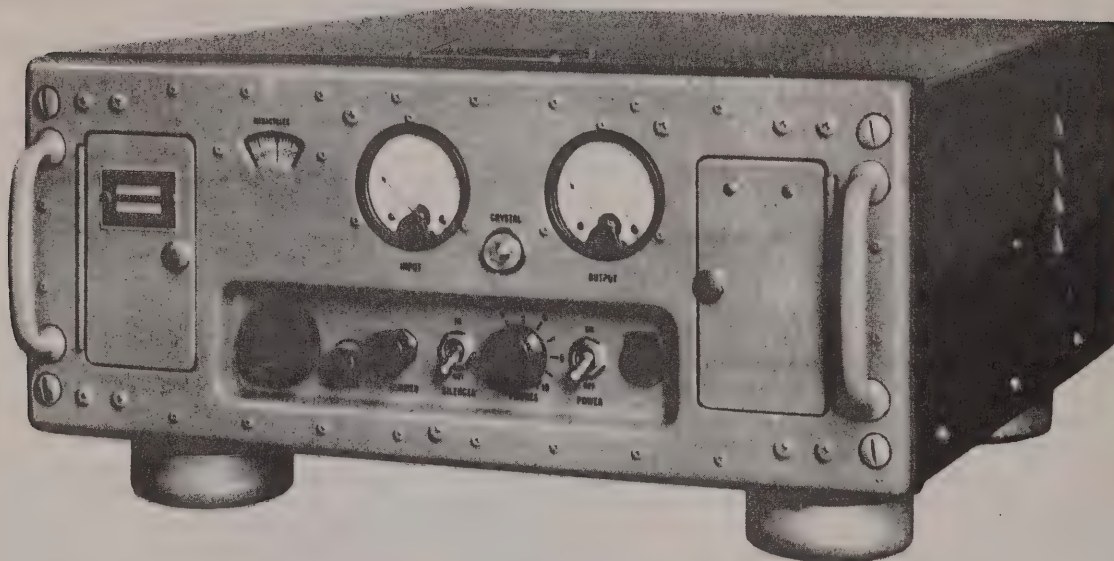


Figure 1-2. Front View, Shock Mounts Attached, Relay Rack Mounting Brackets Removed

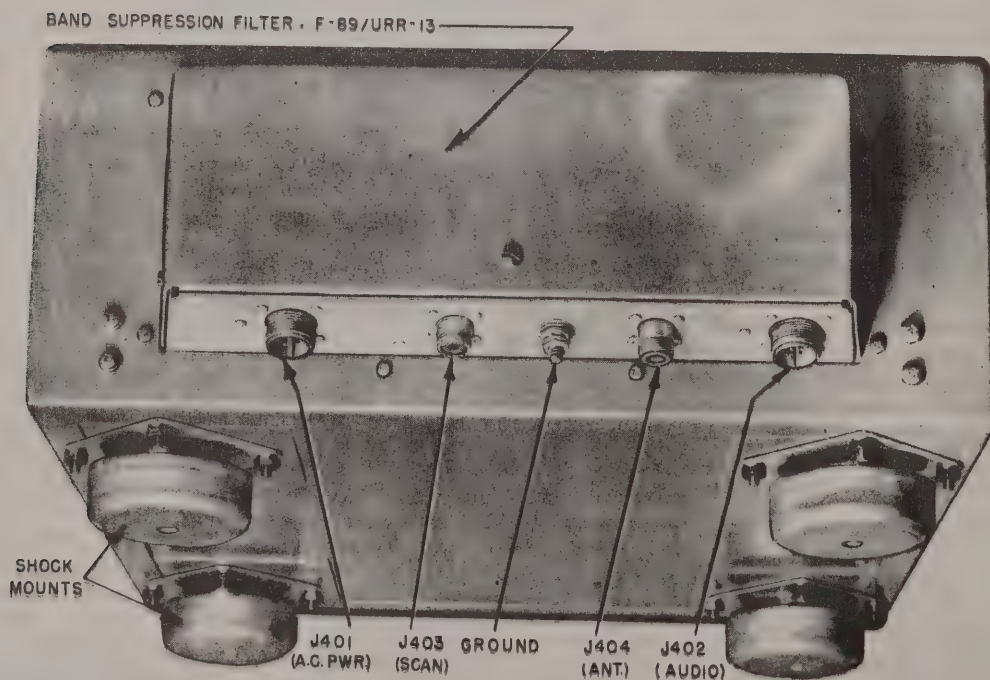


Figure 1-3. Rear View (from below) Showing A.C. POWER, SCAN, ANT, and AUDIO Connectors on Underside of Band Suppression Filter F-89/URR-13

TABLE 1-1. EQUIPMENT SUPPLIED.

Quan. Per Equip.	Name of Unit	Designation	Overall • Dimensions*			Volume •	Weight •
			Height	Width	Depth		
1	Radio Receiver, including: 1 set (4 pc) plugs for external cords (packed in cloth bag) and 1 pair relay rack mounting brackets	R-266/URR-13 (See table 3-2) (See figure 3-7)	8-7/16 7	17-1/2 1-1/8	19-1/8 12	2817 —	57 4 oz. 1 lb., 5 oz.
2	Instruction books	Navships	11	8-1/2	3/4	68	(Est.)
1 1	Repair parts box Set equipment repair parts	(See fig. 3-8) (See parts list table 8-4)	6-1/8	19	10	1164	15 } 8 } 23

* Unless otherwise stated, dimensions are expressed in inches, volumes in cubic inches and weights in pounds.

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Quan. Per Equip.	Name of Unit	Designation	Required Use	Required Characteristics
1	Antenna	See applicable installation drawing	Signal pick-up	1/4-wave, broad band; to cover 225-400 mc frequen- cy range; 50-ohm terminal impedance
As Re- quired	Antenna transmission line	See applicable installation drawing	Antenna to receiv- er connection	50-ohm surge impedance; co- axial
1 each Channel	Crystal units	Jan type CR-24/U	Crystal control of tuning	$f_{\text{xtal}} = \frac{\text{channel freq.} + 18.6\text{mc}}{12}$
As Re- quired	Power cable	MCOS-2	Power input from 50-60 cps, 110- 120 v source	2 wires; #18 or larger
As Re- quired	Audio output cable	TTHFWA-1	Audio output con- nection to inter- phone or other audio responsive device	Twisted shielded pair
1	Headphones, with cord and plug	Navy Type 49016	Listening	600 ohms impedance
1	Loud-speaker or other audio responsive device		Listening	600 ohms input impedance
As Re- quired	Scan channel output cable (if panoramic tuning in- dicator is used)	AN Type RG-8/U	Connection to pano- ramic tuner	Coaxial 50-ohm surge im- pedance (AN type RG-8/U)

TABLE 1-3. SHIPPING DATA.

Shipping Case Number	Contents		Overall Dimensions*			Volume •	Weight •
	Name	Designation	Height	Width	Depth		
1	Radio Receiving Set	AN/URR-13	15-1/2	35-1/2	23-1/4	12,793	166-1/4 (Est.)

* Unless otherwise stated, dimensions are expressed in inches, volumes in cubic inches and weights in pounds.

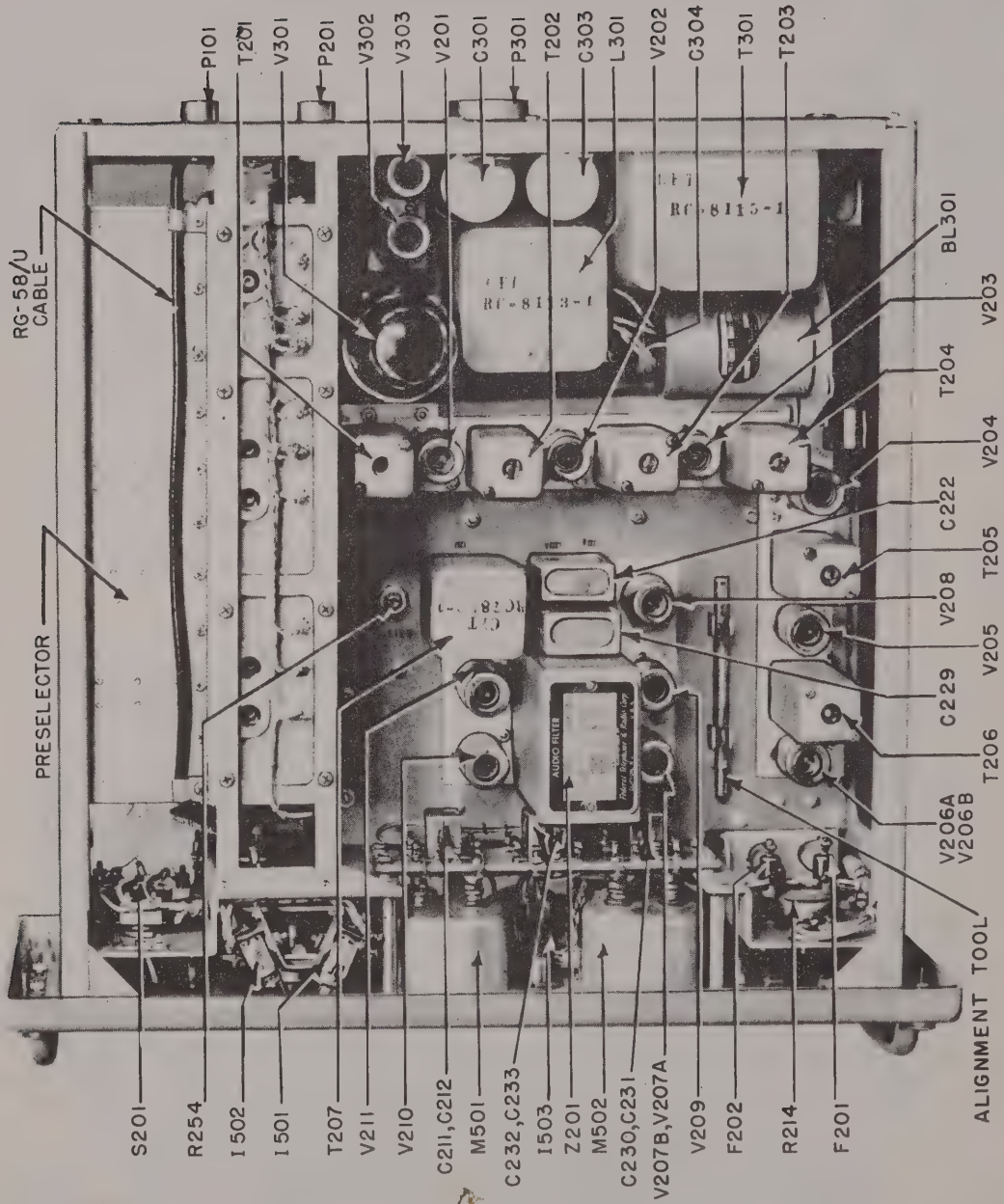


Figure 1-4. Top View of Chassis

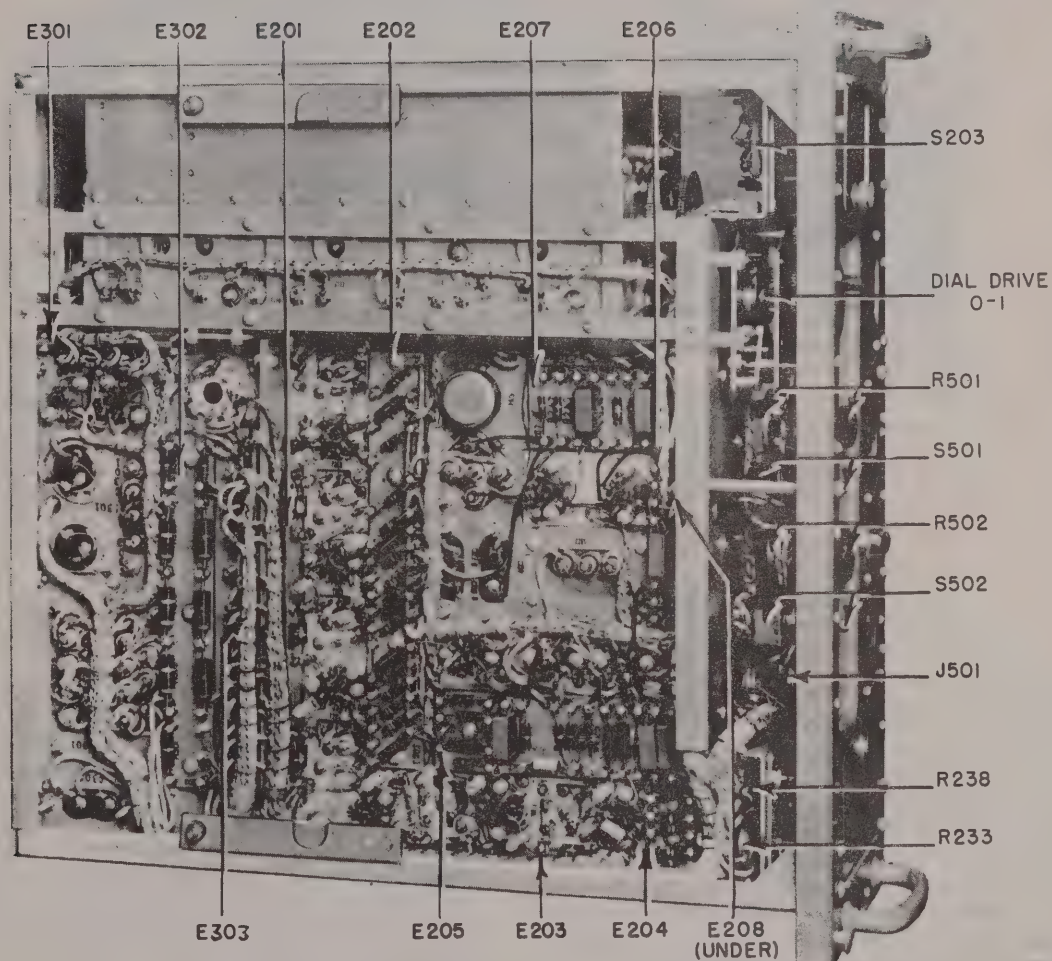


Figure 1-5. Bottom View of Chassis

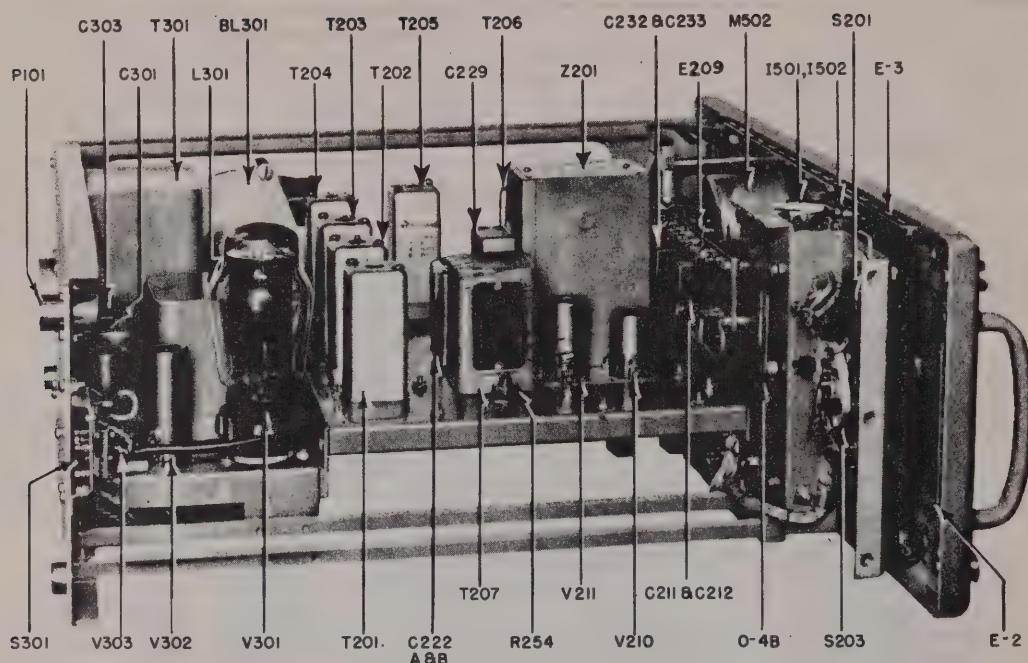


Figure 1-6. Chassis with Preselector Removed; Left Side View

3. DESCRIPTION OF MAJOR SUB-ASSEMBLIES.

a. CABINET—Figure 3-3 is a view into the cabinet with the panel and chassis assembly removed. It is fabricated from an aluminum alloy and finished in a gray enamel. Guide rails, located on the bottom of the cabinet, permit easy withdrawal of the panel-and-chassis assembly. When installed in a standard relay rack, the angle brackets used for mounting it are attached to the sides of the cabinet and the four shock mounts are removed. When the cabinet is arranged for table mounting, these brackets are detached and four shock mounts bolted to the bottom of the cabinet in their stead. Ventilation is provided through dust filters and louvers on either side of the cabinet by means of an internal blower.

b. FRONT PANEL AND CHASSIS FRAME ASSEMBLY.—An aluminum frame, attached to the front panel, mounts the preselector, IF/AF and power supply chassis to form a complete chassis assembly. See figure 1-4. The panel is finished in a gray enamel which blends with the color of the cabinet and is fitted with handles to permit withdrawal of the panel-and-chassis assembly from the cabinet. A spring stop mechanism on each side permits nearly complete with-

drawal of the chassis from the cabinet but prevents its falling out due to roll, tilt, shock or vibration. When these stop mechanisms are pressed upward by the fingers through holes in the bottom of the chassis frame, the panel-and-chassis assembly may be completely withdrawn. The two hinged doors on either side of the front panel are held closed by knurled-head spring fasteners. These are released by a half-turn to the left giving access to crystals, fuses and the semi-fixed controls or adjustments. The locations of these and the other panel-mounted controls and parts are indicated in figure 4-1.

c. PRESELECTOR SECTION.—The preselector section is mounted along the left side of the chassis frame, as shown in figures 1-4 and 1-5, and comprises all parts of the r-f amplifier-converter and oscillator-multiplier sections. The r-f amplifier section is above the oscillator-multiplier section, and each consists of an aluminum casting with removable covers. The two r-f amplifier stages and the mixer, or first detector, are mounted in the r-f amplifier-converter section. The basic oscillator, two frequency-doubler stages and a frequency-tripler stage are mounted in the oscillator-multiplier section. Partitions in the castings provide r-f shielding between stages.

TABLE 1-4. ELECTRON TUBE COMPLEMENT.

Circuit	Circuit Symbols	Quantities of Tubes Used									
		9003	6J6	6L-5670	6AK5	6BA6	6AL5	6AK6	5U4G	OB2	OA2
PRESELECTOR											
1st R-F Amplifier	V101	1									
1st R-F Amplifier	V102	1									
2nd R-F Amplifier	V103	1									
2nd R-F Amplifier	V104	1									
Mixer	V105A		1/2								
Mixer	V105B		1/2								
Oscillator	V106A			1/2							
1st Doubler	V106B			1/2							
2nd Doubler	V107A		1/2								
2nd Doubler	V107B		1/2								
Tripler	V108				1						
Tripler	V109				1						
IF/AF SECTION											
1st I-F and Scan Channel Amplr.	V201					1					
2nd I-F Amplr.	V202	1									
3rd I-F Amplr.	V203	1									
4th I-F Amplr.	V204	1									
5th I-F Amplr.	V205	1									
2nd Detector	V206A						1/2				
AVC Diode	V206B						1/2				
Noise Limiter Diode	V207A						1/2				
Silencer Diode	V207B						1/2				
Silencer Amplr.	V208				1						
1st A-F Amplr.	V209				1						
2nd A-F Amplr.	V210				1						
A-F Output Amplr.	V211							1			
POWER SUPPLY SECTION											
Rectifier (+180v)	V301								1		
Regulator (+105v)	V302									1	
Regulator (+150v)	V303										1

The five-section signal-frequency tuning capacitor, C101, in the r-f amplifier converter section and the four-section tuning capacitor, C102, in the oscillator-multiplier section are geared together to synchronize their rotation. Each of these ganged capacitors consists of a number of split stator sections, and of as many rotor sections mounted on a common metal shaft. Wiping contacts ground the shaft to the casting wall. The effective rotation of the ganged capacitors is 85 degrees, and their capacity is maximum when the rotor plates are fully meshed with the split-stator plates.

The tuning inductances for the r-f amplifier sections, and for the multiplier-tripler section, consist of semi-circular strips of invar. The adjustable trimmer inductances consist each of two parallel rods and an adjustable shorting bar. These inductances, and the

concentric cylinder type trimmer capacitors, are integral parts of the ganged capacitor sections as shown in figures 1-9 and 1-10. The tuning capacitors for the basic oscillator and for the two doubler stages are similar in construction. The oscillator coil is of ceramic construction to provide a high degree of stability with temperature variations. The doubler coils are space-wound solenoids on mica-filled bakelite forms.

All the tube sockets are mounted directly over the related sections of the ganged tuning capacitors to reduce lead lengths to a minimum.

d. DIAL DRIVE ASSEMBLY.—Tuning is accomplished by a smooth and free-running gear train mechanism employing spring-loaded gears to insure freedom from back-lash. This mechanism provides an effective 19-to-1 reduction ratio between the tuning

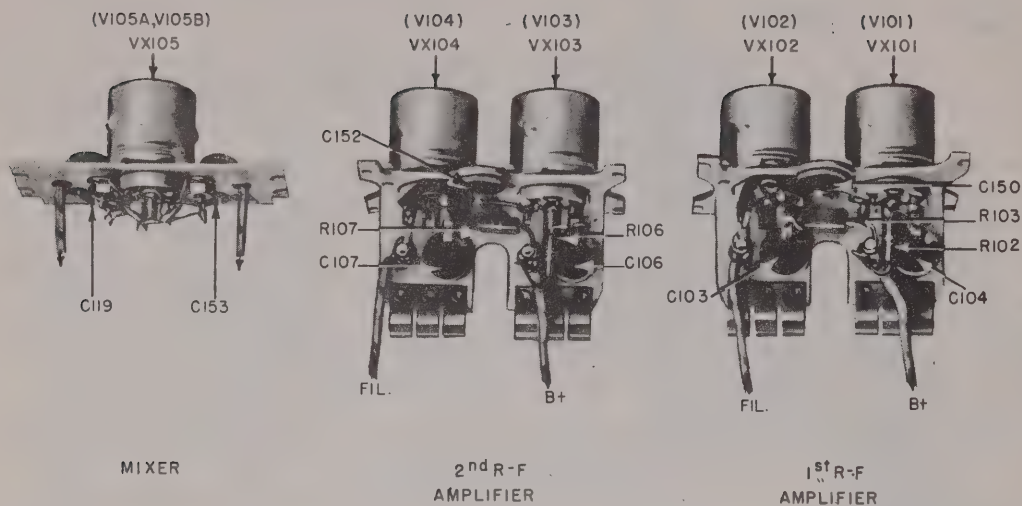


Figure 1-7. Socket Plate and Shield Assemblies from R-F Amplifier Section of Preselector

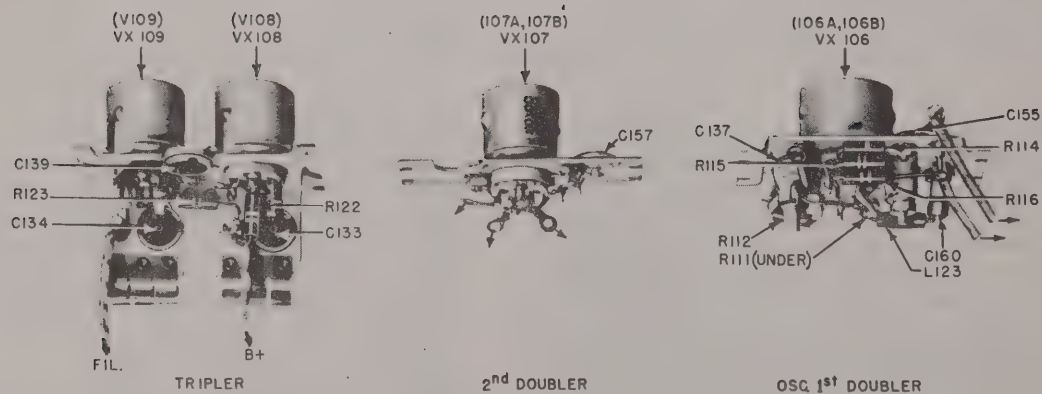


Figure 1-8. Socket Plate and Shield Assemblies from Oscillator-Multiplier Section of Preselector

crank on the front panel and the main drive shaft of the preselector, with automatic mechanical stops at each end of the range. With this arrangement 19 complete revolutions of the tuning crank will rotate the calibrated dial through 240 degrees, and will turn the ganged capacitors through their full 85 degrees of rotation, thereby covering the entire 225-400 megacycle frequency band of the receiver.

The main tuning indicator dial is $2\frac{3}{8}$ " in diameter and is calibrated directly in megacycles. Markings appear at each two-megacycle division, with each fifth marking indexed, and each tenth marking identified with the appropriate frequency numerals. Rotation of the tuning crank in a clockwise direction increases the frequency.

The calibrated dial is illuminated by two six-volt pilot lamps mounted behind the panel. A DIMMER control potentiometer mounted on the dial drive assembly, behind the front panel, permits control of the brilliance of the dial lamps.

A locking device is included to permit locking the tuning drive mechanism at any desired frequency setting.

e. THE IF/AF SECTION.—The IF/AF section of the chassis is shown in figures 1-4, 2-6A and 2-6B. It is located on the right-hand side of the chassis frame, and mounts the circuit parts of the five i-f stages, the second detector, the automatic volume control circuit (AVC), the silencer and the silencer amplifier circuits, the noise limiter circuit and the three stages of audio amplification.

f. POWER SUPPLY SECTION.—The power supply section of the chassis, shown in figures 1-4 and 2-14, is mounted at the rear of the IF/AF section. It includes all the circuit parts necessary to provide the a-c and d-c voltages required for operation of the equipment from a source of 110/115/120 volt, 50-60 cps, single-phase power.

The power transformer and the filter parts are designed to provide a power supply of reduced size and weight in comparison with the power requirements. The blower is also mounted on this chassis.

g. CABLE FILTER ASSEMBLY*.—The cable filter assembly appears in figures 1-3, 1-11 and 3-3. It contains r-f noise filter circuits for the audio output and power input circuits, and provides through connections from the receiver proper to the antenna input and scan channel output circuit connectors. The filter parts are mounted on a base plate which is attached to the rear wall of the receiver cabinet by means of snap-slide fasteners located on the inside of the cabinet. The filter cover, when attached to the base plate, constitutes an r-f shield. The A.C. POWER input, AUDIO output, SCAN channel output and ANTENNA transmission line input connectors (P401-P04), to which all external connections except head-

phones are made, are mounted on the underside of the filter assembly on an angle bracket attached to the base plate. When the receiver panel-and-chassis assembly is slid into the cabinet, three connectors (plugs) on the rear of the receiver engage mating connectors (receptacles) on the rear of the filter base plate, establishing connections between the external and internal receiver circuits. The filter components are made accessible for servicing by removal of the filter cover, without removing the filter from the receiver cabinet.

4. ASSOCIATED EQUIPMENT.

The components and parts described below are not supplied with the receiver but is required to complete the installation of a type AN/URR-13 radio receiving equipment.

a. ANTENNA.—The antenna to be used with this receiver must be designed to have an impedance of approximately 50 ohms with characteristics that result in good matching with the transmission line over the frequency range of 225-400 megacycles. The applicable installation plan will indicate the particular type of antenna to be used.

One rod or ground plane is grounded to the supporting tube and the outer conductor of the coaxial transmission line. The "line" radiator extending downward is supported by an insulated stud connected to the center lead of the antenna.

b. ANTENNA TRANSMISSION LINE.—A coaxial transmission line having a characteristic impedance of about 51 ohms is required for connection between the antenna and the receiver. The applicable installation drawings indicate the type to be used for this purpose.

c. SCAN CIRCUIT.—The SCAN connector (J403) on the cable filter at the rear of the cabinet can be connected to a panoramic type radio frequency scanning adapter to provide visual indication of the signals being picked up by the receiver. The scanning channel has a frequency response which is flat within six db over a bandwidth of 600 kilocycles. If scanning equipment is used, a 51-ohm coaxial transmission line such as AN type RG-8/U cable should be employed. However, no such equipment is supplied with Radio Receiving Set AN/URR-13, and none is required for its satisfactory operation as a receiver.

d. PHONES AND SPEAKER.—The audio output circuit at the AUDIO receptacle (J402) on the rear of the equipment is designed to operate into any load impedance between 60 and 600 ohms, and to maintain its output voltage constant within three db over this impedance range. Audio output is also wired to a phone jack on the front panel (J501). Any 600-ohm headphones fitted with a Navy type 49109, 49106B or 49034 plug can be connected into this jack.

* Band Suppression Filter F-89/URR-13

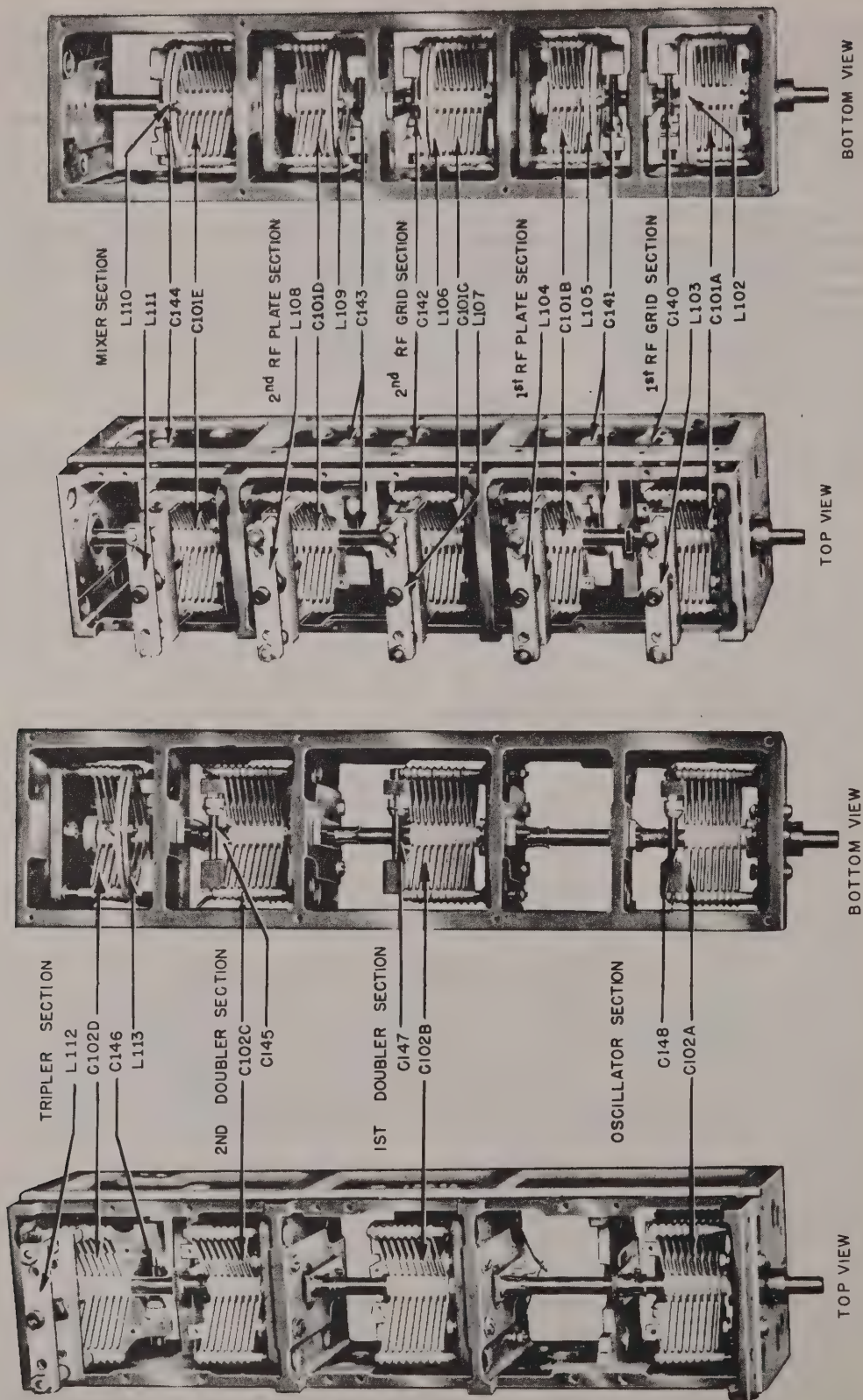


Figure 1-10. Ganged Capacitor (C101) from R-F Amplifier Section of Preslector

Figure 1-9. Ganged Capacitor (C102) from Oscillator-Multiplier Section of Preslector

c. **CRYSTALS.**—The equipment is designed for use with a JAN type CR-24/U crystal in the crystal clip in the left-hand front panel compartment. This should be in place whether the equipment is operated with MANUAL or CRYSTAL controlled tuning. Complete data on this type of crystal unit are given in figure 7-16.

5. REFERENCE INFORMATION.

a. **REFERENCE DATA.**—Pertinent data concerning Radio Receiving Set AN/URR-13 are given below:

- (1) Nomenclature — Radio Receiving Set AN/URR-13.
- (2) Contract Number—NObsr-43176.
- (3) Date of Contract—6 Jan. 1949.
- (4) Contractor—Federal Telephone & Radio Corp., 100 Kingsland Road, Clifton, N. J.
- (5) Cognizant Naval Inspector—Inspector of Naval Material, 1060 Broad Street, Newark, N. J.

(6) Number of Packages—Complete equipment including equipment repair parts in one wood shipping case. (See figure 3-1).

(7) Total Cubical Contents (crated)—12,793 cu. ins.

(8) Total Cubical Contents (uncrated)—2817 cu. ins.

(9) Total weight (crated)—166 lbs.

(10) Total Weight (uncrated)—57 lbs.

b. **ELECTRICAL CHARACTERISTICS.**—The following is a summary of the electrical characteristics of Radio Receiving Set AN/URR-13,

(1) Frequency Range—Rated: 225-400 mc; max.: 222.75—404.0 mc.

(2) Tuning Bands—Complete coverage of frequency range with 19 consecutive turns of tuning control crank.

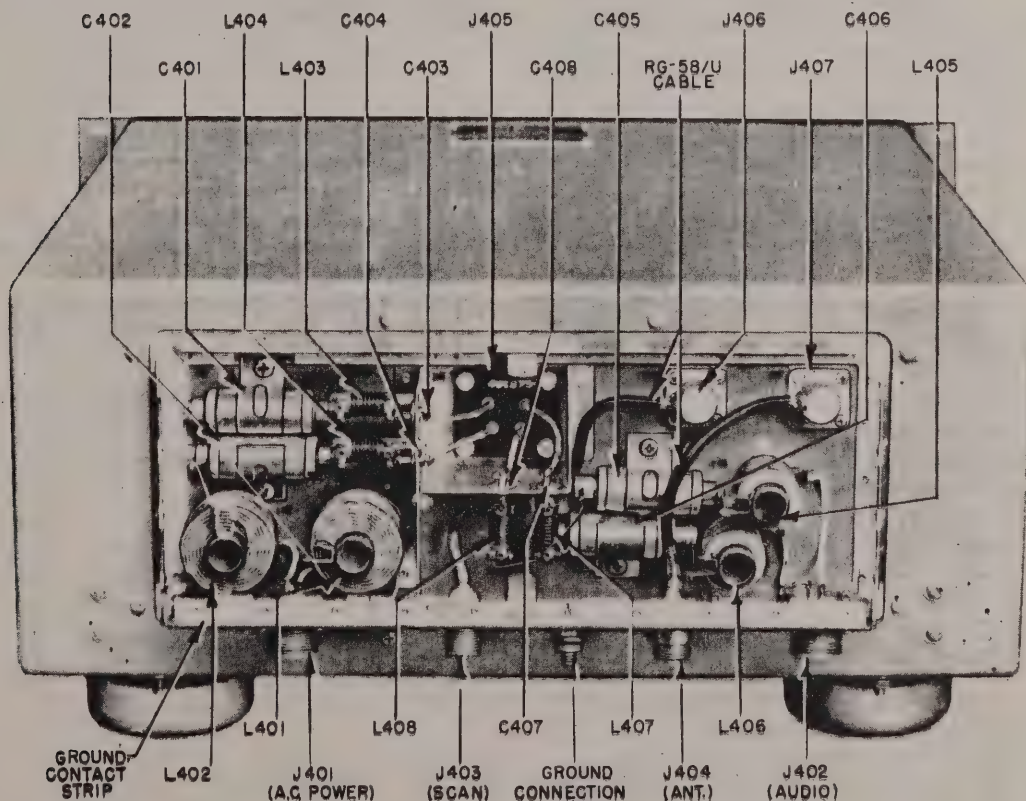


Figure 1-II. Rear View Showing Band Suppression Filter F-89/URR-13, with Filter Housing Removed

- (3) Number of Preset Frequencies—(a) MANUAL Tuning: None—(b) CRYSTAL Tuning: One, as determined by crystal unit installed.
- (4) Type of Frequency Control—Crystal-controlled Oscillator (CRYSTAL tuning operation only).
- (5) Type of Receiver—Superheterodyne.
- (6) Intermediate Frequency—18.6 Megacycles (center frequency) ± 2 kc.
- (7) Receiver Output—
 - (a) Audio Channel Output (J402)—60 milliwatts, max., into a 600-ohm load, with 7% max. distortion, or 600 milliwatts, max., into a 60-ohm load, with 7% max. distortion.
 - (b) Phone Jack (J501) Output—Approximately 60 milliwatts max. into a 600-ohm load.
 - (c) Scanning Channel Output—10 microvolts, min., across a 50-ohm load for a signal input voltage of 25 μ v max.
- (8) Type of Reception—Amplitude modulated signals, primarily voice.
- (9) Overall stability of receiver for any selected channel in the 225-400 mc range, when operated between 110 and 120 volts (T301 on 115 volt tap), between -20°C (-4°F) and $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$) and between 30% and 95% humidity:

	Crystal- Controlled	Free- Running
For voltage variation	Negligible	Negligible
For temperature variation	$\pm 0.009\%$	20 p/m/ $^{\circ}\text{C}$
For humidity variation	$\pm 0.009\%$	30 p/m/% chg.

- (10) Crystals—
 - (a) Type—JAN Type CR-24/U. Not supplied by contractor.

- (b) Oscillating Frequency—Crystal frequencies from 20.3000 to 34.8833 mc cover 225-400 mc tuning range of receiver with total multiplication of 12.
- (c) Heterodyne Frequency Range—For 225-400 mc reception: 243.6 to 418.6 mc. For 222.75-404.0 reception: 241.35 to 422.6 mc.
- (11) Silencer Circuit Characteristics:
 - (a) Effective Silencing Range—Up to minimum of 15000 micro-volts input (100% rotation of control).
 - (b) Audio Output Reduction—Up to 40 db under standard output conditions.
 - (c) Time constant of circuit—Less than 0.5 seconds.
- (12) Impedances:
 - (a) Antenna Input—51 ohms. Designed for coaxial antenna transmission line.
 - (b) Audio Channel Output:
 - (1) Nominal—600 ohms.
 - (2) Output load range within which output voltage variation is less than 3 db for constant input adequate to produce output to 1.9 volts (6 milliwatts) at 1000 cps, across a 600-ohm out-put load—600-60 ohms.
 - (3) Phone Jack—600 ohms, nominal.
 - (4) Scan Channel Output—51 ohms. Designed for coaxial transmission line such as AN type RG-8/U.
- (13) Antenna System—None supplied. An antenna having 51-ohm terminal impedance, is recommended.
- (14) Power Source Characteristics:
 - (a) Voltage—110/115/120 volts, 60 cps, 1 phase.
 - (b) Current Requirement—Nominal, 0.97 amps.; maximum, 1.04 amps.
 - (c) Power—Nominal, 112 watts; maximum, 120 watts.

SECTION 2

THEORY OF OPERATION

1. GENERAL PRINCIPLES.

Radio Receiver R-266/URR-13 is of the superhetrodyne type, designed for either manual tuning or crystal-controlled operation over a frequency range of 225 to 400 megacycles. The receiver will provide audio output to headphones or to an external speaker or intercommunication system. Output provisions are also included for an external panoramic (r-f sweep) adapter, as explained below in paragraph 2b (1).

As shown in the block diagram, figure 2-1, the receiver is basically conventional in most respects. Two stages of r-f amplification precede the mixer stage. The local injected signal is obtained from an oscillator followed by three stages of frequency multiplication. The oscillator functions as either a crystal-controlled or self-excited circuit, depending on the position of the CRYSTAL-MANUAL switch. The five-gang capacitor which tunes the r-f and mixer stages is geared to the four-gang capacitor in the oscillator-multiplier section to provide single-control tuning. All stages in the receiver "front end" are part of a compact preselector sub-assembly.

The received signal is converted to an intermediate frequency of 18.6 mc and amplified by five stages of i-f amplification. The signal is then rectified by the 2nd detector and by the AVC rectifier. The AVC voltage developed is applied to the grids of both r-f amplifiers, the first four i-f amplifiers and the first a-f amplifier. The audio output of the 2nd detector passes through a series valve type noise limiter (which may be by-passed) into the first a-f voltage amplifier. The output of this amplifier passes through an a-f band-pass filter (Z201), having a pass-band of 350 to 3500 cps, and through a silencer diode into the second a-f amplifier. The amplified audio signal is then applied to the a-f output stage, the output of which drives the headset or external speaker. Output is also monitored by the OUTPUT meter (M502).

The silencer diode between the band-pass filter and second audio amplifier is controlled by the silencer amplifier, which permits the diode to conduct when a signal is present at the 2nd detector. If no signal is present, the diode cuts off, preventing any noise from reaching the second audio stage. The noise silencer may be cut IN or OUT by action of the SILENCER switch.

2. DETAILED CIRCUIT ANALYSIS.

a. PRESELECTOR.

(1) R-F AMPLIFIER SECTION.

(a) ANTENNA INPUT. The antenna input

circuit of Radio Receiver R-266/URR-13, having a nominal 50-ohm impedance, is to be used with 52-ohm coaxial transmission line. The transmission line connects to the ANT. receptacle (J404), located on the bottom of Band Suppression Filter F-89/URR-13, at the rear of the receiver.

Note

A male plug (AN type UG-21B/U; P404) designed to mate with receptacle J404 is supplied for attachment to the antenna lead in cable at the time of installation.

A short piece of coaxial cable in the filter extends the antenna transmission line to connector J407, at the rear of the filter base plate (figure 3-3). This connector, in turn, plugs into coaxial receptacle P101, from which the antenna circuit extends to the series inductances, L101 and L121, and is coupled by them to the input circuit of the first r-f amplifier stage.

Inductances L101 and L121 form an assembly consisting of an outer conductor of bent copper tubing, with an insulated inner conductor. This arrangement serves to transform the unbalanced coaxial input to a balanced circuit.

(b) TUNING CAPACITOR ASSEMBLY. The details of this assembly are shown in figure 1-10. The grid and plate circuits of the two r-f amplifier stages and the grid circuit of the mixer stage are arranged in push-pull, and are tuned by means of a balanced type, five-gang capacitor.

Each section of this capacitor consists of a split-stator plate assembly and a rotor plate assembly mounted on a common metal shaft. The shaft is grounded to the chassis frame by means of wiping contacts located between the sections. The trimmer inductances (L103, L104, L107, L108 and L111), and the trimmer capacitors (C140-C144) are integral parts of the stators and are connected across the split-stator plates. The tank circuit inductors (L102, L105, L106, L109 and L110) are horseshoe-type metal strips. The trimmer inductors (figure 7-7) each consist of two parallel, round rods connected by a shorting bar. Positioning of the shorting bar varies the inductances of each coil. The concentric-cylinder type trimmer capacitors each consist of a metal block mounted on one stator section, and a partially-threaded rod which extends from a bracket on the other stator section into the center bore in the block. The block and rod constitute, respectively, the stator and rotor plates of the trimmer capacitor. The capacity of the trimmer is varied by turning the rod to adjust

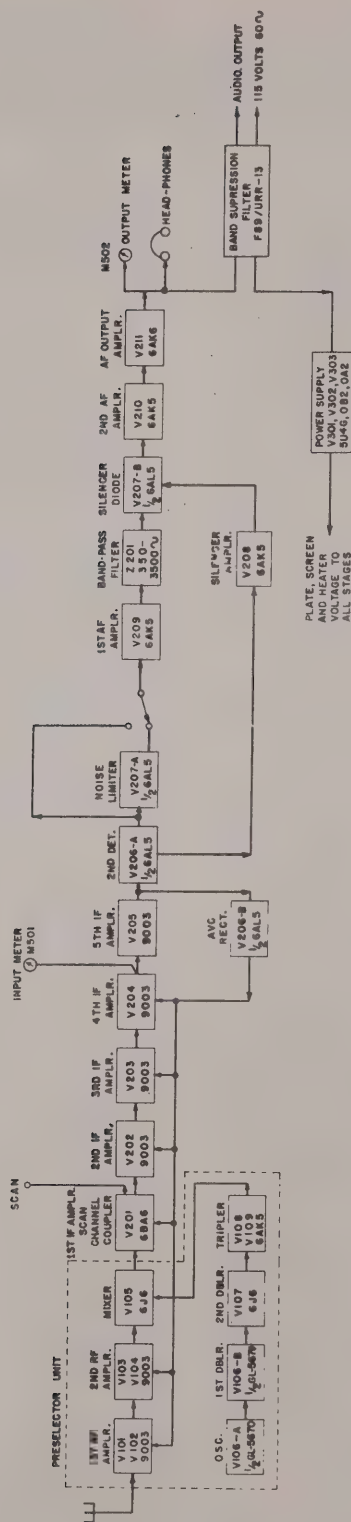


Figure 2-1. Block Diagram—Radio Receiver R-266/URR-13

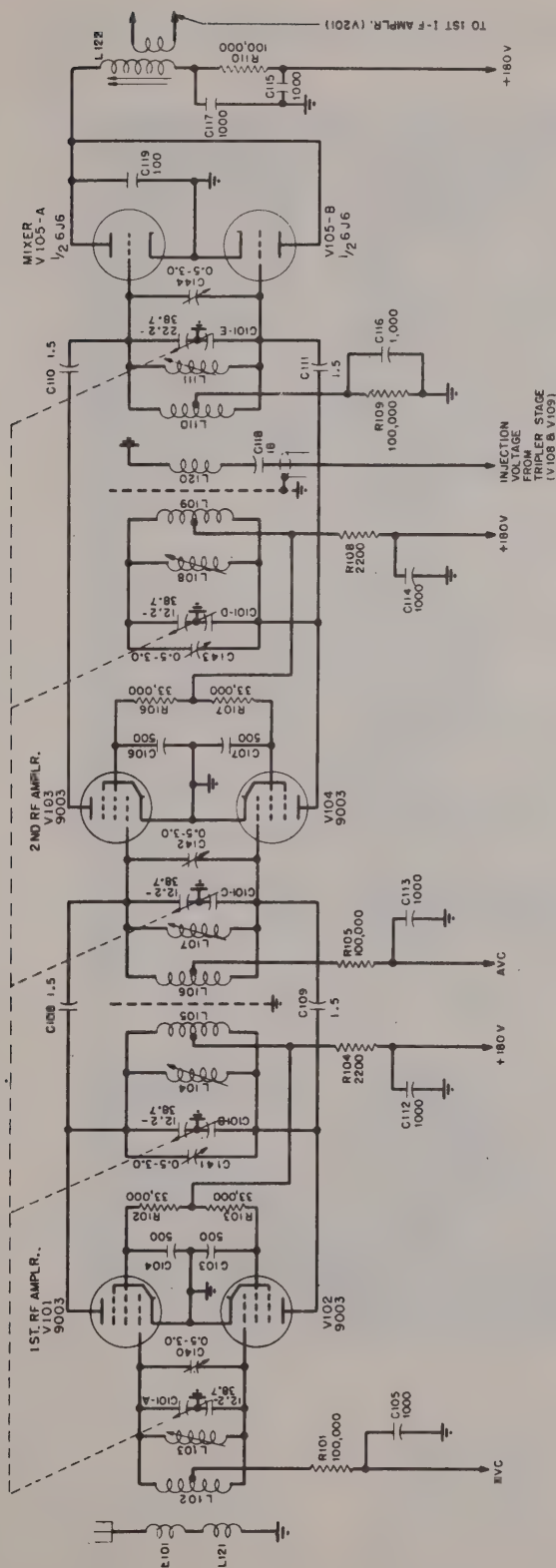


Figure 2-2. Simplified Schematic—R-f Amplifier Section of Preselector

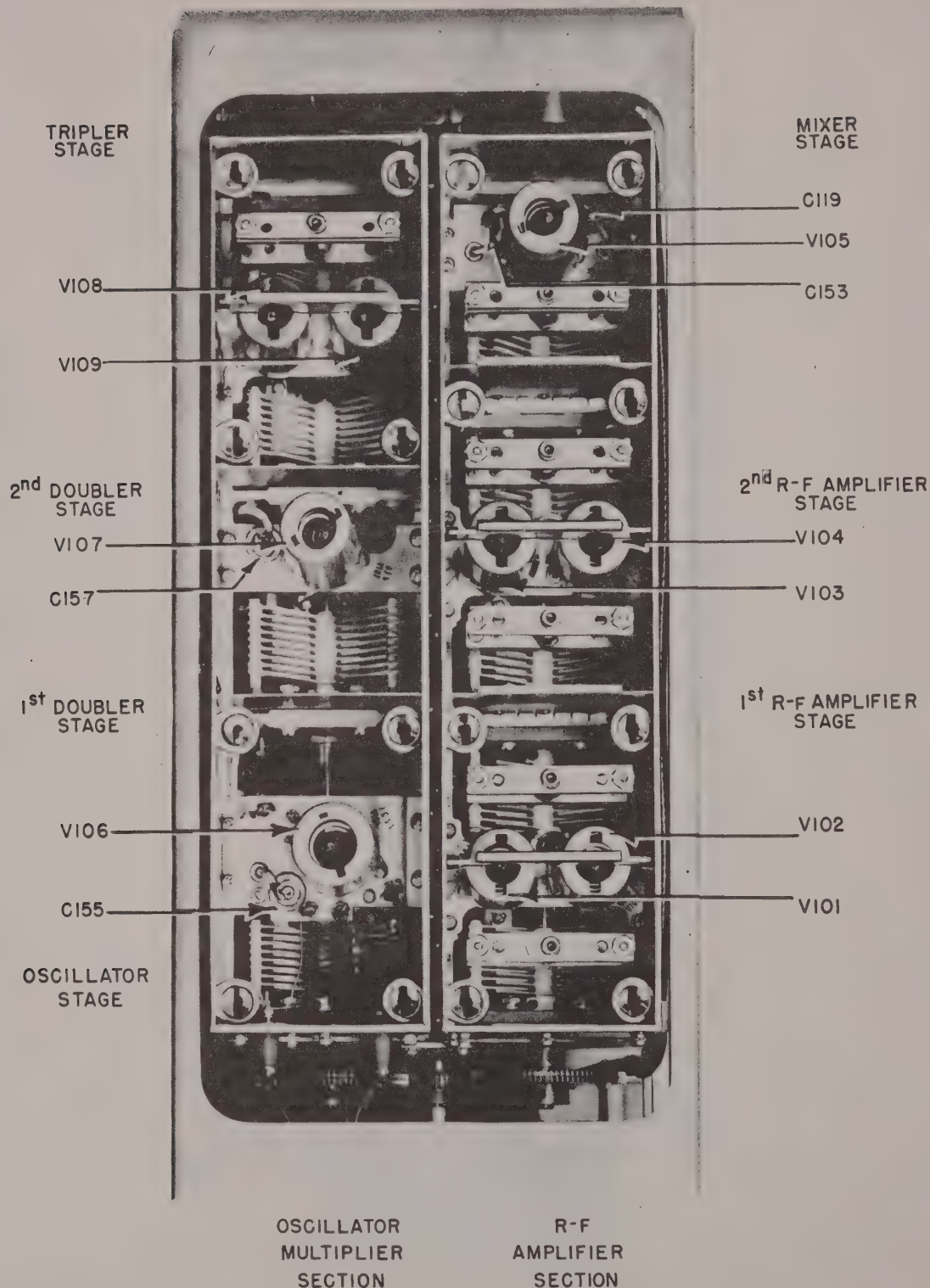


Figure 2-3. Preselector from Left Side of Chassis, Shielding Covers Removed

the amount of projection into the block. An insulating tube in the bore of the block serves as the dielectric.

(c) **FIRST R-F AMPLIFIER.** As shown in the simplified schematic diagram, figure 2-2, the antenna circuit is coupled to the grid input circuit of this stage. The grid circuit consists of tank inductance L102, trimmer inductance L103, a section of capacitor C101, and trimmer capacitor C140. Critical coupling is employed at the high end of the band to maintain uniform sensitivity over the entire frequency range. Two type 9003 tubes, V101 and V102, are operated in push-pull. These tubes are remote cut-off pentodes, to permit employment of AVC. The push-pull arrangement serves to reduce the lengths of the connecting leads to a minimum and to cancel out spurious radiation of unwanted signals into the antenna. AVC voltage is applied to the grid circuit of this stage through decoupling resistor R101 and the center tap on coil L102. A feed-through type r-f by-pass capacitor (C105) functions to by-pass the AVC line at this point. This capacitor is located in the casting wall. The screen voltage is applied through decoupling resistor R104 and through screen voltage-dropping resistors R102 and R103. The 180-volt supply is by-passed to ground at this point by capacitor C112, while resistors R102 and R103 are by-passed by the button-type silver-mica capacitors, C104 and C103, respectively. The plate circuit is similar in design to the grid circuit and consists of basic inductance L105, a section of C101, trimmer inductance L104, and trimmer capacitor C141. Plate voltage is brought through resistor R104 to the center tap on coil L105. No appreciable inductive coupling exists between the plate circuit of the first r-f stage and the grid circuit of the second r-f stage because coils L105 and L106 are shielded from each other by the wall of the casting. Coupling between these two stages is accomplished by means of capacitors C108 and C109, which are connected directly from the plates of the tubes in the first stage to the grids of the tubes in the second stage. With tubes having a nominal value of transconductance, the gain of the first r-f amplifier is approximately 7db.

(d) **SECOND R-F AMPLIFIER.** This stage, employing tubes V103 and V104 in push-pull, is identical in design and in circuit constants to that of the first r-f stage (figure 2-2). The tuned grid circuit consists of a section of capacitor C101, tank inductor L106, trimmer inductor L107, and trimmer capacitor C142. The plate circuit consists of a section of capacitor C101, tank inductor L109, and the trimmers L108 and C143. AVC voltage is brought to the center tap of coil L106 through decoupling resistor R105; the AVC line is by-passed to ground by capacitor C113. Plate and screen voltages are brought through resistor R108; the supply is by-passed to ground at this point by capacitor C114. R107 and R106 are screen voltage-dropping resistors, which are by-passed by capacitors

C107 and C106, respectively. The plate voltage is brought to the center tap of coil L109. The output of the second r-f stage is capacitively coupled to the grid circuit of the mixer stage through capacitors C110 and C111. No appreciable inductive coupling exists between L109 and L110 or L120, since L109 is isolated from the mixer grid circuit by the preselector casting wall. The r-f gain of the stage is approximately 7db.

(e) **MIXER.** The mixer, or first detector, stage employs a JAN type 6J6 dual triode, V105, in a push-push arrangement (figure 2-2). The grid circuits are connected in push-pull through the resonant circuit consisting of a section of capacitor C101, tank inductor L110, trimmer capacitor C144, and trimmer inductor L111. The plates of the tubes are connected in parallel to plate transformer L122. Capacitor C119, connected between the plate of the mixer tube and ground, serves to tune L122 to resonance at the intermediate frequency. This capacitor is connected directly to ground to provide a low-impedance path for other than intermediate frequency r-f currents. With the push-push arrangement of the mixer a high order of conversion gain is obtained because the push-push conversion transconductance is approximately twice that of a single converter tube.

The output of the second r-f stage is coupled to the grid circuit of the mixer stage by capacitors C111 and C110, while the output of the oscillator-multiplier circuit is inductively coupled to the grid circuit of the mixer through a coupling loop consisting of coil L119 and capacitor C135 in the oscillator-multiplier unit (figure 2-5), and coil L120 and capacitor C118 on the r-f converter (figure 2-2). This coupling arrangement maintains the mixer injection voltage more uniform over the frequency range of operation. The values of capacitors C118 and C135 are so chosen that, together with the shunt capacity of the short coaxial connecting line and the coupling coils, the loop is series resonant at a frequency (190 mc) below the low end of the band, and parallel resonant at a frequency (470 mc) above the high end of the band. Consequently, at the low-frequency end, the transfer voltage induced in the converter input tank is increased, while at the high end of the band the induced transfer voltage is reduced. If the coupling were not resonant, as described above, the induced voltage would tend to drop off at the low end and increase at the high end of the band, due to the change in "Q" of the oscillator-multiplier tank circuits.

The output of the mixer stage is link coupled to the grid circuit of the first i-f stage. The type of coupling is made necessary by the physical layout of the equipment. The plate coil of the mixer (L122) is contained in the mixer compartment of the r-f amplifier casting, while the i-f input transformer (T201) is located on the IF/AF chassis. A length of dual conductor r-f cable (AN type RG-108/U) joins the secondary wind-

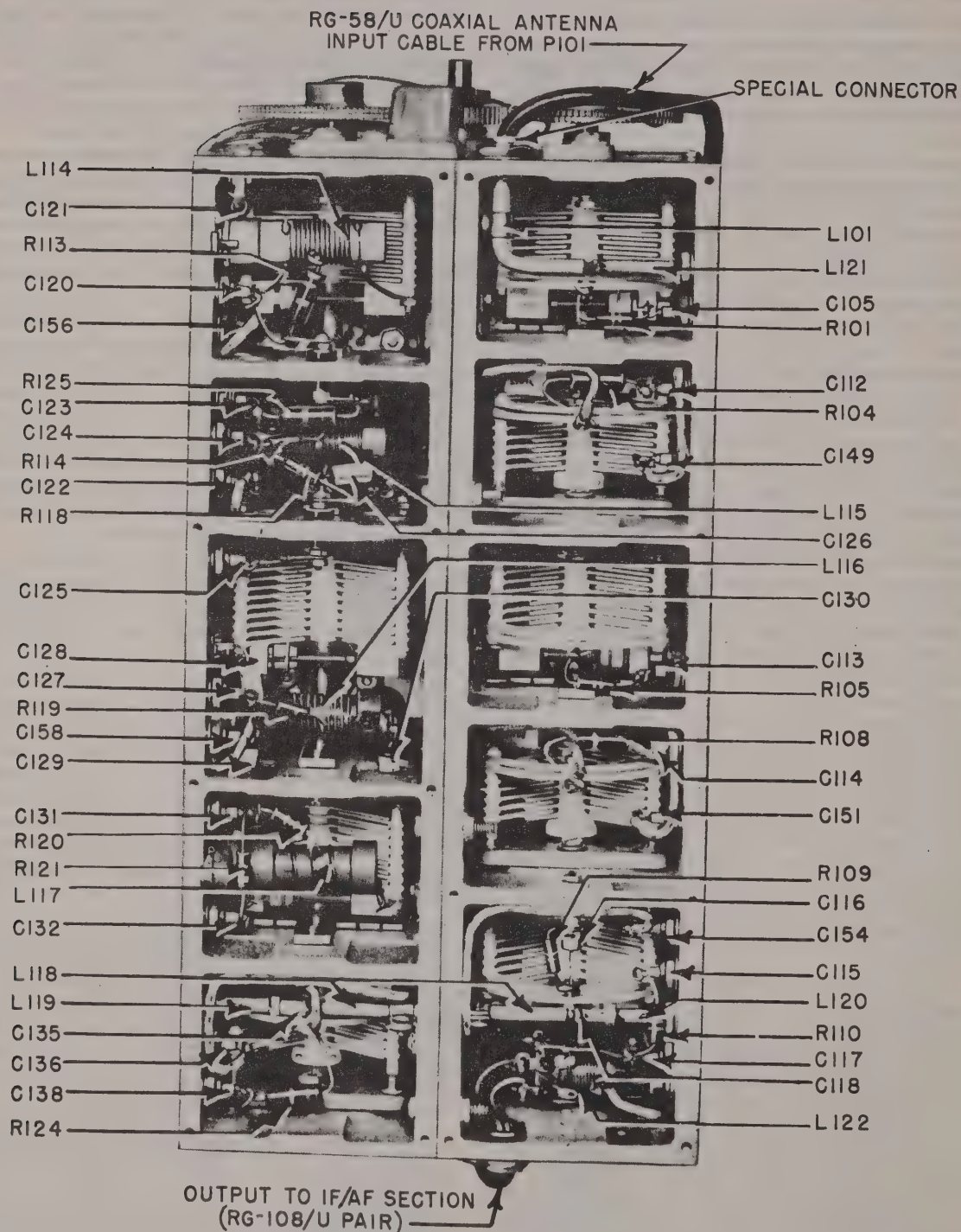


Figure 2-4. Preselector from Bottom, Shielding Covers Removed

ing of transformer L122 on the r-f amplifier chassis and the primary winding of transformer T201 on the IF/AF chassis, thus establishing low impedance inductive coupling between the two circuits.

Plate voltage is supplied to the primary of L122 through resistor R110. Capacitors C115 and C117 by-pass the B+ line and R110, respectively. The grids of V105 are biased by the voltage developed across grid-leak resistor R109, which is by-passed by capacitor C116.

(2) OSCILLATOR - MULTIPLIER SECTION.

The oscillator-multiplier section generates the local injection signal 18.6 mc higher in frequency than the received signal. The basic oscillator frequency is generated in tube V106 and multiplied twelve times in the two doublers and one tripler which follow, as shown in the simplified schematic diagram, figure 2-5. Tuning of the various stages is accomplished by capacitor C102, which is a four-section capacitor, each section being of the split-stator type. The use of split-stator capacitors in the balanced tank circuits permits the use of a grounded rotor to reduce inter-sectional capacitance. Rotor grounding is accomplished by wiping contacts located between the capacitor sections. Since no appreciable r-f currents flow through these contacts, the inherent noise associated with wiping contacts is not present. Capacitor C102 is geared to the five-section capacitor C101 to provide single-control tuning of the receiver. The trimmer inductances and capacitors utilized in the oscillator-multiplier stages are integral parts of the tuning capacitor, similar to those described previously in subparagraph 2a (1) (b), this section.

(a) OSCILLATOR-FIRST DOUBLER. The oscillator and first doubler stages utilize a type GL-5670 dual triode (figure 2-5). One half of the tube, V106-A, functions as a grounded-grid oscillator. The second half of the dual triode, V106-B, is arranged as a split-load cathode follower, and serves as both a frequency doubler and a source of feedback to the oscillator cathode.

The oscillator functions as a crystal-controlled circuit when switch S203 is in the CRYSTAL position. The crystal, Y201, is a harmonic-mode type which establishes the feedback from the cathode of V106-B to the cathode of V106-A. Capacitor C159, in series with the crystal, is utilized to resonate the inductance of the crystal leads so that zero phase shift exists between the two cathodes.

For manual tuning, the crystal is shorted out by switch S203 in the MANUAL position. V106-A then functions as a free-running oscillator, the frequency of which is determined by the setting of tuning capacitor C102-A. Since the feed-back path between the cathodes of the two triode sections is not frequency selective, the stability of the free-running oscillator is not as great as the crystal-controlled circuit.

On MANUAL tuning the receiver may be operated

with or without a crystal in the crystal socket. However, since the original factory adjustment of the receiver was made with a crystal in the socket, it follows that dial calibration will be more accurate, and the reserve gain greater, if the receiver is operated in this same manner during MANUAL operation in the field. In the neighborhood of 400 megacycles the resonant frequency of the receiver increases approximately 0.1% when the crystal is removed from the socket; near 225 megacycles the corresponding increase is approximately 0.04%. This effect is attributable to the fact that there is some capacity between the crystal and ground, which also exists effectively between the cathodes of the oscillator tubes and ground. Removing the crystal from its socket removes this capacity and so causes a shift in the frequency of the oscillator.

The oscillator tank circuit consists of variable capacitor C102-A, trimmer capacitor C148 and coil L114. The tank circuit is kept balanced by the use of capacitor C121, which equalizes the output capacitance of the tube. Resistor R112 tends to suppress spurious oscillation. Inductance L123 reduces the heater-to-cathode capacitive reactance so that the phase shift of the signal applied from the cathode of the 1st doubler tube to the oscillator cathode is as small as possible, while capacitor C160 keeps L123 from shorting the bias developed across resistor R111 to ground. Plate voltage is fed to the center tap of coil L114 through resistor R113 from a 150-volt regulated source; the B+ line is by-passed for radio frequency by capacitor C120.

The output of the type V106-A oscillator tube is coupled to the grid of the first doubler through capacitor C137. Grid bias for V106-B is provided by the voltage drop across cathode resistor R116 and by the drop across grid-leak resistor R114. Plate voltage is applied through the untuned primary of bifilar-wound transformer L115; voltage is obtained from a 150-volt regulated source through decoupling resistor R125, which is by-passed for radio frequency by capacitor C123.

The first-doubler cathode circuit is not by-passed, so that the r-f voltage drop across resistor R116 may be fed back to cathode resistor R111. The values of R111 and R116 are such that the feedback is limited, preventing oscillations which might occur due to the capacity across the crystal holder.

A test point is provided at the grid of the first doubler to measure the d-c bias on the tube. The measured voltage is indicative of the amount of drive from the oscillator. Resistor R115 and capacitor C122 decouple the grid circuit from the point of measurement.

(b) SECOND DOUBLER. The second doubler stage employs the two sections of the type-6J6 dual triode, V107, in a push-push circuit arrangement



Figure 2-5. Simplified Schematic—Oscillator-Multiplier Section of Preselctor

(figure 2-5). The grid circuit is balanced and is tuned to the 2nd harmonic of the oscillator frequency. The tuned circuit consists of the center-tapped secondary winding of transformer L115, a section of the ganged capacitor C102 and trimmer capacitor C147. Capacitor C126 compensates for the capacitance unbalance to ground in the secondary winding of transformer L115.

The grids are returned through the center tap on the secondary of L115 and through resistors R117 and R118 to a -3 volt tap on the power supply. This bias holding voltage functions to prevent excessive rise in plate current if driving voltage is removed. Capacitors C124 and C125 function to by-pass r-f currents around this circuit. A test point, connected to the junction of resistors R117 and R118, provides means for measuring the second-doubler grid-leak bias, thus indicating the relative amount of drive from the first doubler.

The plates are tied in parallel, untuned coil L116 constituting the plate load. This coil is center-tapped to provide a balanced load for coupling to the grids of the tripler stage. Capacitor C128 at the ground side of coil L116 functions to balance the output capacity of the second doubler tubes at the other side of the coil. Plate voltage is applied through decoupling resistor R119 to the center tap of coil L116. C127 functions as an r-f by-pass capacitor. The output of the 2nd doubler stage is coupled to the grid circuit of the tripler stage V108, by means of capacitors C129 and C130. No appreciable inductive coupling exists between L116 and L117, since the two coils are isolated by the preselector casting.

The push-push circuit arrangement reduces the generation of odd harmonics. This eliminates the possibility of resultant spurious signals which might otherwise be amplified and radiated by the receiver antenna.

(c) **TRIPLER.** The tripler stage employs two type 6AK5 pentodes, V108 and V109, in push-pull (figure 2-5). The parallel-resonant grid circuit consists of coil L117, a section of capacitor C102, and trimmer C145, and is tuned to the 4th harmonic of the oscillator frequency. The center tap of coil L117 is returned through resistors R120 and R121 to the -3 volt grid-bias tap on the power supply. This bias holding voltage functions to prevent excessive plate current in the tube if the driving potential is removed. The bias holding circuit is by-passed for r-f to ground by means of capacitors C131 and C132. A tap at the junction of resistors R120 and R121 provides a metering point for checking the driving voltage applied to the grids of the tripler tubes, by measuring the grid-leak bias developed across resistor R121. The tap is also connected to the ALIGN position of switch S201 for alignment purposes, as explained in paragraph 2e of this section.

The plate circuit of the tripler stage is tuned to

resonance at a frequency three times its grid input frequency, which results in a plate-circuit output frequency 18.6 mc higher than the receiver incoming signal frequency. The tripler plate circuit is a parallel-resonant combination of coils L112 and L113, and capacitors C102 and C146. Plate and screen voltages are applied through resistor R124 to the center tap of L113 and the junction of screen-grid-dropping resistors R122 and R123 respectively. Capacitors C136, C133, and C134 provide r-f by-pass to ground, as required.

The output of the tripler stage is inductively coupled through coil L119 and capacitor C135 on the oscillator-multiplier chassis, and through capacitor C118 and coil L120 on the r-f converter chassis, to the grid circuit of the mixer stage, as described in paragraph 2a(1)(e).

b. **I-F AMPLIFIER STAGES.** The mixer output is link-coupled to the receiver i-f section which consists of five stages of amplification tuned to the intermediate frequency, 18.6 mc. The overall i-f selectivity curve is shown in figure 7-6.

(1) **FIRST I-F AND SCAN CHANNEL AMPLIFIER.** A type 6BA6 remote cut-off pentode (V201) is arranged as a split-load amplifier; the tube functions as both the first i-f amplifier and as a cathode follower to provide output for a scanning channel indicator (panoramic adapter). The cathode resistor, R202, is not by-passed, so that the r-f voltage developed across it may be utilized as the scanning channel output (figure 2-7). The scanning output is taken from resistor R202, brought through connector P201 on the IF/AF chassis to jack J406 on the base plate of the cable filter (Band Suppression Filter F-89/URR-13), and then routed through a short piece of coaxial cable to the SCAN output jack (J403) on the rear of the filter.

The signal from the mixer is applied to the grid of V201 through transformer T201. The primary is an untuned, low-impedance winding; the secondary is tuned and is resistance-loaded to provide a scanning band-width of 600 kc, flat to within 6 db. AVC voltage is applied to the grid circuit of V201 through decoupling resistor R201, which is by-passed by capacitor C201-A. Screen voltage is obtained from the 105-volt regulated source through decoupling resistor R203, while the 180-volt plate supply is brought through decoupling resistor R204. Resistors R203 and R204 are each by-passed by a separate section of capacitor C202. The i-f output of V201 is coupled to the second i-f amplifier by means of transformer T202.

(2) **SECOND, THIRD, FOURTH, AND FIFTH I-F AMPLIFIERS.** The simplified schematic diagram of figure 2-8 is typical of the last four i-f stages. Each amplifier utilizes a type 9003 remote cut-off pentode, with double-tuned transformers used as the inter-stage coupling device. All transformers used in the

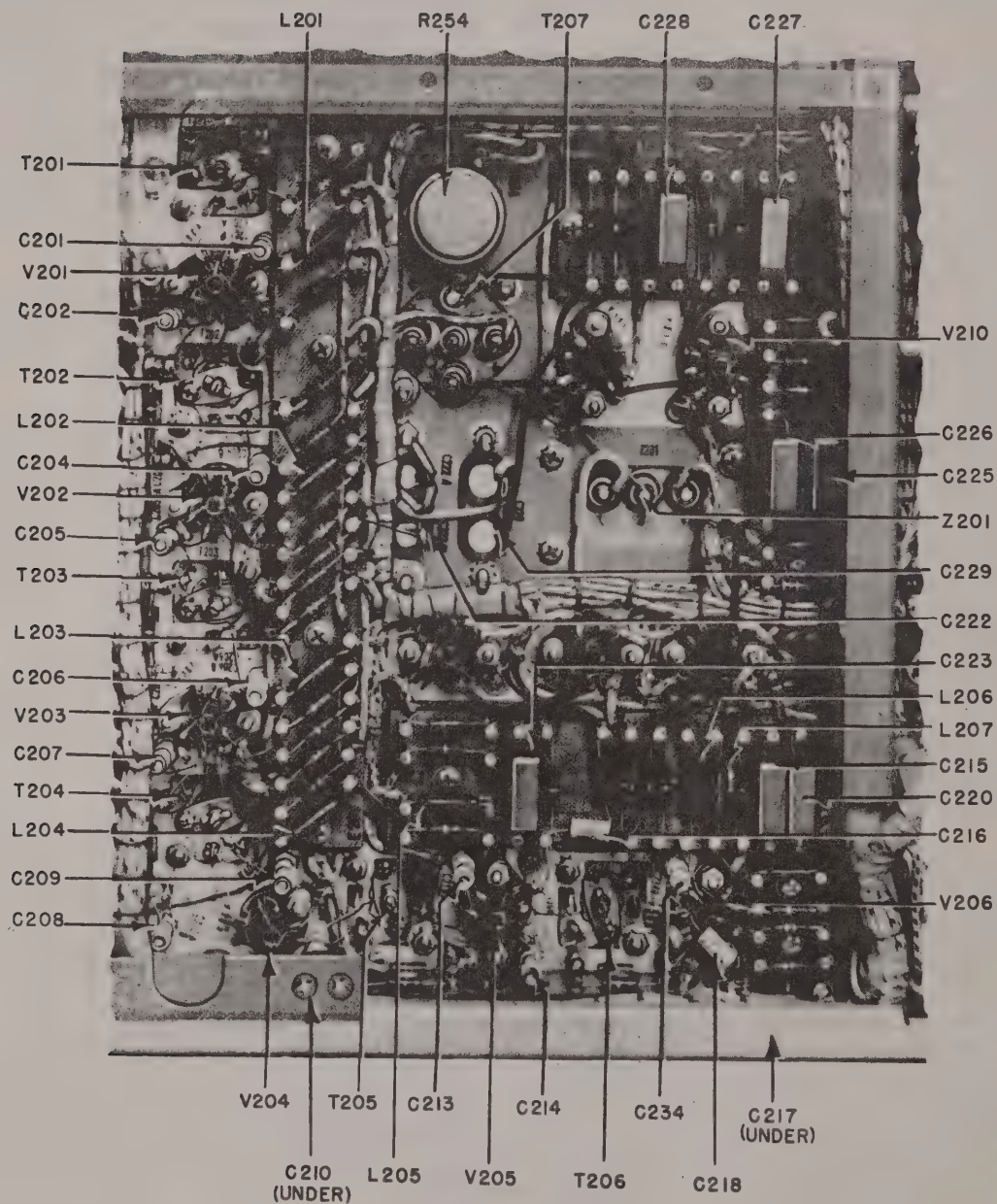


Figure 2-6A. Underside of IF/AF Section (All Parts but Resistors Identified)

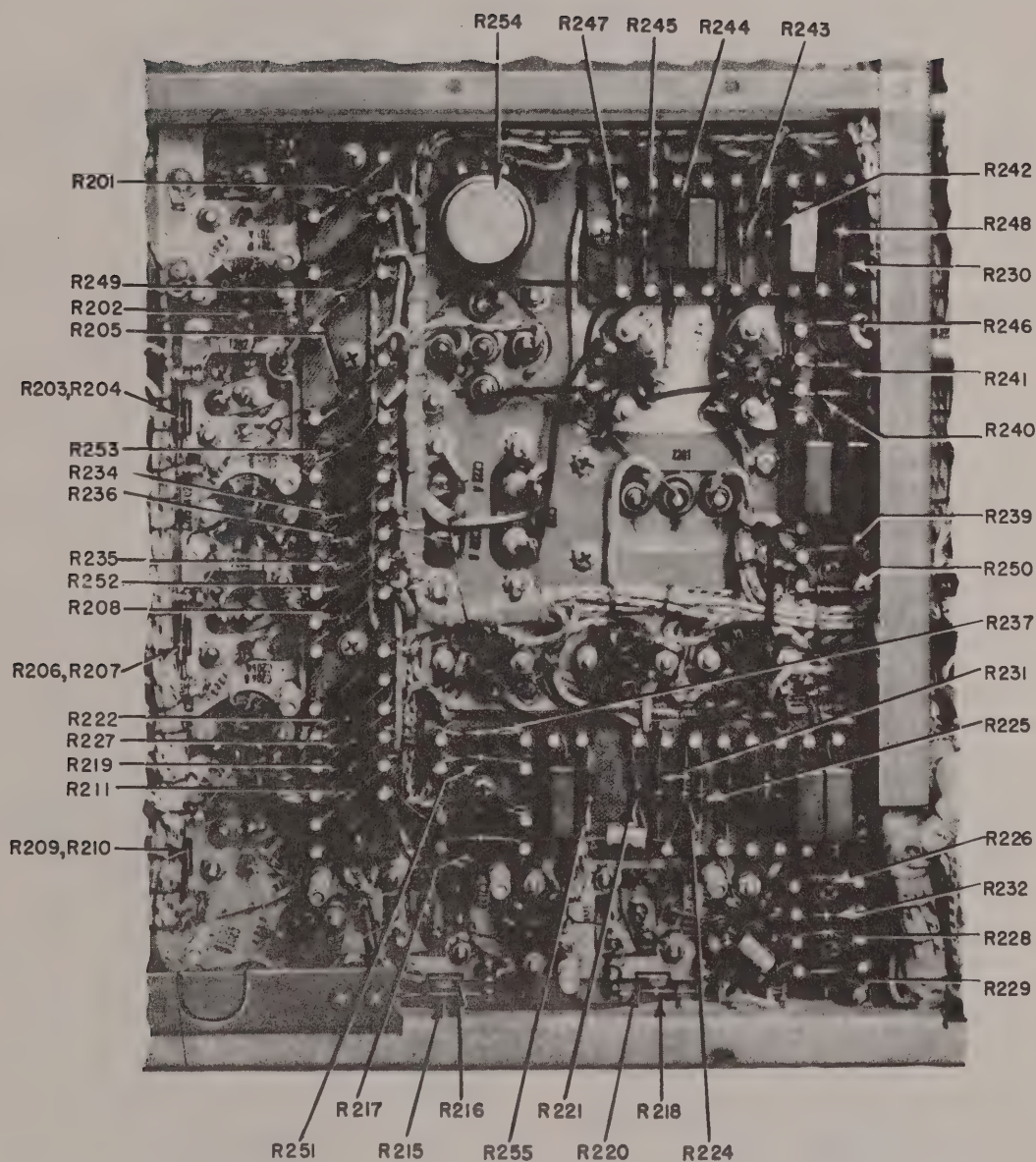


Figure 2-6B. Underside of IF/AF Section (Only Resistors Identified)

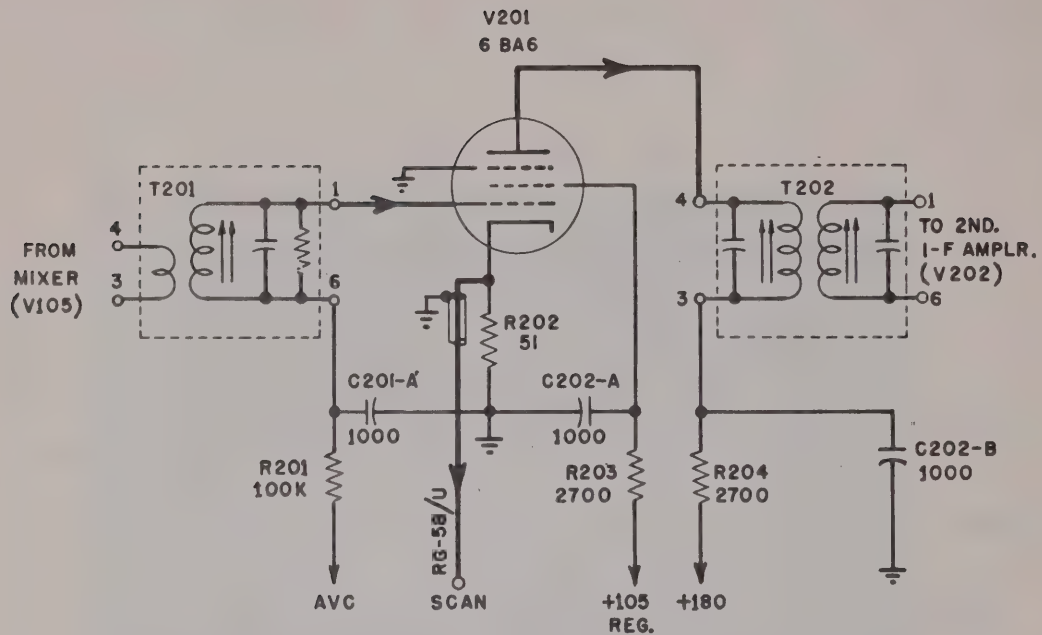


Figure 2-7. Simplified Schematic—First I-f and Scan Channel Amplifier

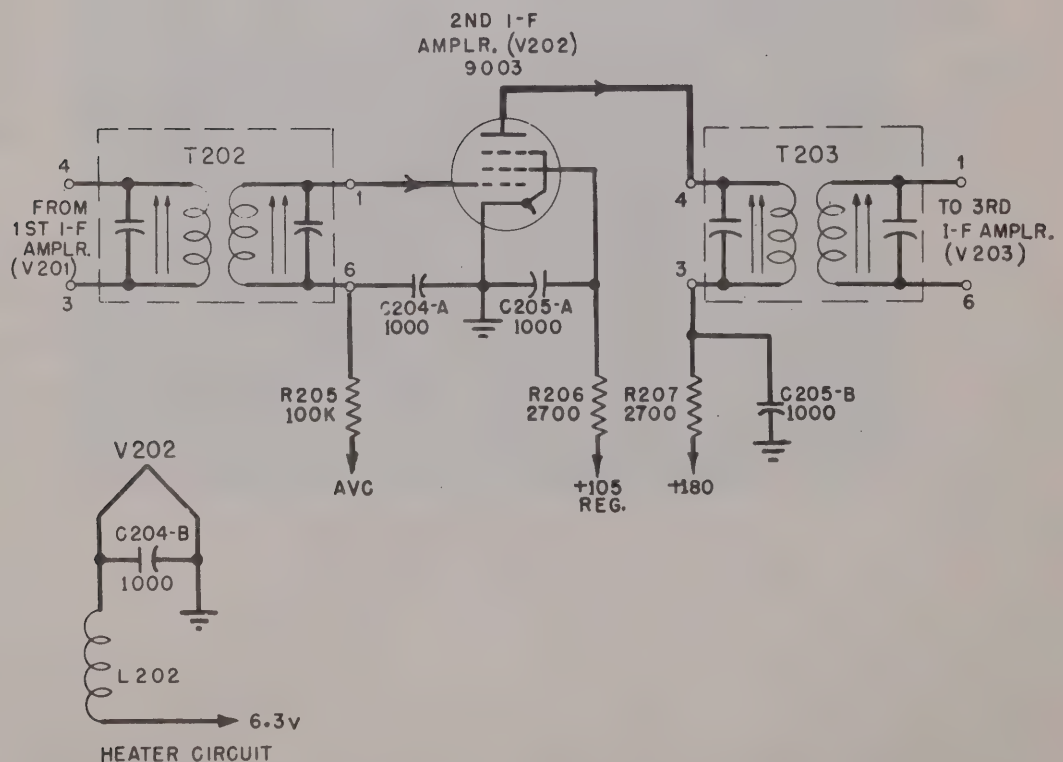


Figure 2-8. Simplified Schematic—Typical I-f Amplifier

i-f section are tuned by means of powdered-iron cores. Screen voltage for all tubes is obtained from the regulated 105-volt tap on the power supply, and plate voltage from the 180-volt tap. Both screen and plate voltages are applied through suitably by-passed decoupling resistors. The grid circuits of the second, third and fourth i-f amplifiers (V202, V203 and V204) are returned to the AVC line through a resistance-capacitance decoupling network. AVC is not applied to the fifth i-f amplifier (V205); instead, terminal No. 6 of transformer T205 is grounded. Grid bias for V205 is developed across cathode resistor R217, which is by-passed by capacitor C213-A.

(3) INPUT METER CIRCUIT. Input meter M501 is provided to indicate the approximate incoming signal strength. It also serves as an alignment indicator for the oscillator-multiplier section when switch S201 is placed in the ALIGN position. A simplified schematic of the meter circuit is shown in figure 2-9. One side of meter M501 is connected to terminal No. 3 of transformer T205 through a low-pass filter consisting of R212 and C211. The other side of the meter is connected through a similar filter (R213 and C212) to the arm of INP. MTR. control R214. Potentiometer R214, along with resistors R249 and R305, is in a voltage divider network connected between the 180-volt supply and ground.

With no signal present in the receiver, pentode V204 conducts heavily, causing a voltage drop across resistor R216. The INP. MTR. control, R214, is then adjusted so that the center-arm potential is equal to the potential at terminal No. 3 of transformer T205. This results in equal potentials at each side of meter M501 and, consequently, no meter indication. When a signal is received, the developed AVC voltage increases the bias on V204, and the reduction in plate current decreases the voltage drop across resistor R216. Since a voltage difference then exists across the meter terminals, an indication is obtained on the meter.

The INPUT METER functions in the same manner when used for alignment purposes. However, the AVC voltage is replaced by the tripler grid-leak bias, as explained in detail in paragraph 2e, this section.

c. SECOND DETECTOR. A simplified schematic diagram of the second detector is shown in figure 2-10. One half (V206-A) of a type 6AL5 dual diode is used in a conventional diode circuit. I-f transformer T206 couples the signal from the fifth i-f stage (V205) to the detector. Resistors R224, R225 and R226 constitute the diode load, which is by-passed for radio frequency by capacitors C216 and C217-A. The audio-frequency output, obtained at the junction of resistors R224 and R225, is coupled through capacitor C220 to the first a-f amplifier grid when noise-limiter switch S202 is in the OUT position.

d. NOISE LIMITER. When noise-limiter switch S202 is in the N.L. (on) position, a series-valve noise limiter is placed in the circuit between the second de-

tector and first audio stage (see figure 2-10). The limiter, V207-A, is one half of a 6AL5 dual triode which functions as follows:

The negative voltage, developed across second detector resistors R224 and R225, is applied through resistor R221 to capacitor C215, building up on this capacitor a negative potential equal to the total average rectified d-c voltage, as measured between terminal No. 6 of T206 and ground. The audio-frequency component of the rectified voltage is taken from the detector diode circuit at the junction of resistors R224 and R225. The audio-frequency path is then from plate to cathode of V207-A, across switch S202, and through capacitor C220 to the grid of the 1st audio amplifier tube (V209). It will be noted that the cathode of V207-A is at the potential of terminal No. 6 of T206, which is more negative than the plate potential of V207-A because of the voltage divider action of R224 and R225. Since the diode cathode is at a negative potential with respect to the plate, current flows from plate to cathode and an a-f path is established through this tube. In the event that a sharp pulse of noise is received the long time constant of R221 and C215 does not permit capacitor C215 to become charged to the high transient voltage. However, terminal No. 6 of T206 rapidly follows the change, placing the plate of V207-A at a more negative potential than the cathode, thereby cutting off current flow in the tube for the duration of the noise pulse. Consequently, the noise pulse does not enter the audio-frequency amplifier circuit. Resistor R226 in the cathode of the 2nd detector acts as an accelerating circuit to bring the noise limiter diode V207-A to the condition of non-conduction more quickly, when a noise pulse enters the receiver. A positive pulse from the cathode end of R226 is coupled to the limiter-diode cathode through capacitor C215 and resistor R223. Thus, an additional positive voltage is initially present at the cathode, which aids in cutting off tube V207-A.

Resistors R219 and R227 form a voltage divider across the 105-volt regulated supply, producing a positive voltage of approximately one volt. This is applied through resistor R222 to the cathode of V207-A. The positive bias is required to balance out the contact potential of this tube, permitting operation of the diode as a noise limiter on lower levels of noise. By normally operating the cathode of V207-A considerably more negative than the plate, allowance is made so that clipping does not occur on modulation peaks below a certain level.

e. AVC RECTIFIER. One half of a 6AL5 dual diode (V206-B) is utilized in the AVC circuit, which is shown in simplified form in figure 2-11. The diode is connected as a shunt rectifier across the secondary of transformer T206; coupling is accomplished through capacitor C218 and capacitors C216 and C217-B in series. With switch S210 in the REC. position, the diode load consists of resistors R229 and

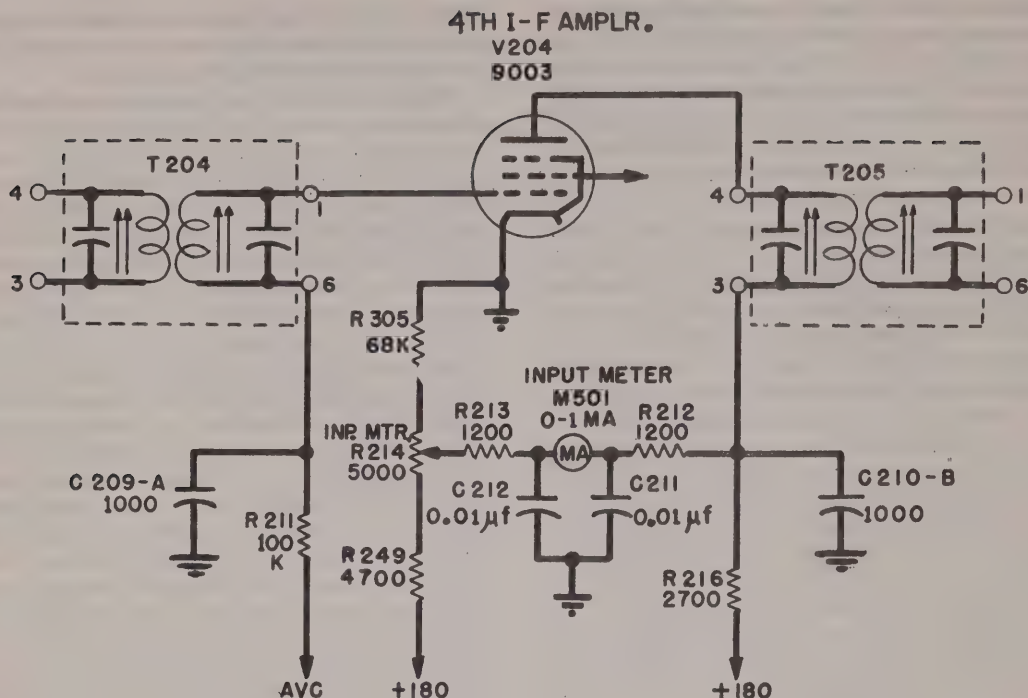


Figure 2-9. Simplified Schematic—Input Meter (M501) Circuit

R230. The junction of these two resistors is at a potential of three volts negative which places the diode plate at this same voltage. The three-volt negative potential is developed across resistors R230 and R248 by the return plate current which flows through them. The cathode is connected to the junction of resistors R230 and R248, placing it at a potential of approximately two volts negative. Thus, AVC delay is provided by the resultant one-volt bias. AVC voltage is applied to the r-f amplifiers, the first four i-f amplifiers and the first a-f amplifier through resistor R228. Suitable R-C decoupling networks are incorporated in the grid circuit of each of the controlled stages. The long time constant of R228 and C222-A prevents the AVC voltage from following rapid variations in carrier level. Capacitor C221 is a dual r-f by-pass unit.

The AVC circuit also provides means for indicating the alignment of the oscillator-multiplier section of the receiver. When switch S201 is placed in the ALIGN position, the cathode of V206-B is removed from the voltage divider across the three-volt bias source and is connected to the grid return of the tripler stage (V108, V109). Under this condition, the diode load consists of resistors R229, R230 and R248 in the diode circuit and resistor R121 in the tripler circuit (figure 2-5). Both cathode and plate are at a

negative potential of three-volts. As the tuned circuits of the oscillator, first and second doublers, and tripler grid are tuned to resonance, the drive to the tripler circuit will increase. The portion of the resultant tripler grid-leak bias developed across resistor R121 is applied to the AVC diode cathode. Diode current will then flow, causing a negative voltage to appear on the AVC bus. This, in turn, will cause a reading on INPUT meter M501, as explained in paragraph 2b (3). The greater the meter-deflection, the greater the drive and the grid-leak bias at the tripler grid; hence, an indication of alignment is obtained.

f. SILENCER. The noise silencer (squelch) circuit is used to prevent noise from reaching the audio section of the receiver in the absence of an incoming signal of some predetermined minimum level. A controlled diode (V207B) between the first and second audio stages permits the audio signal to pass during conduction, and cuts off the audio signal when it is not conducting. The simplified schematic diagram of figure 2-12 shows the silencer circuit. Tube V207B is one half of a type 6AL5 dual diode, and tube V208, the silencer amplifier, is a d-c amplifier which controls the diode.

The audio signal is fed to the cathode of V207-B from filter Z201 (see figure 2-1) through audio gain control R238 and capacitor C225. When the diode

conducts, the audio signal reaches the second a-f amplifier through capacitor C226. The silencer circuit functions when the SILENCER switch (S501) is in the IN position. During reception of a signal a negative voltage is developed at terminal No. 6 of the i-f transformer T206. This voltage is applied, through resistor R231, to the grid of the type 6AK5 silencer amplifier tube, V208, as negative bias.

An additional bias voltage is applied to the grid of tube V208 through resistor R251 for the purpose of establishing the threshold of operation of the silencer tube. This voltage, which is positive in potential, is obtained from the regulated 105-volt supply through the voltage divider action of resistors R233 and R253. It can be adjusted from the front panel by means of SILENCER potentiometer R233 located in the right-hand compartment.

When no signal is being received the negative bias developed at the second detector is quite low, and, without silencing, some noise would be present in the audio output of the receiver. The SILENCER control potentiometer acts to silence this no-signal noise output by increasing the positive bias on the grid of tube V208. This causes tube V208 to draw more plate current and increases the voltage drop across resistor R235 thereby making the voltage applied through resistor R236 to the plate of the silencer diode

(V207B) lower than the diode cathode voltage. This stops current flow in the diode and prevents the conduction of the audio signal through it.

When an input signal appears, the negative bias previously mentioned will increase thereby reducing conduction in the silencer amplifier (V208) and raising the plate voltage. This makes the plate of the control diode (V207B) sufficiently positive for conduction and the output from the first audio stage is then allowed to pass to the second audio amplifier via the diode. In this manner noise is prevented from reaching the second audio amplifier when no useful signal is being received.

The level at which the silencer tube (V208) responds can be adjusted with potentiometer R254, the setting of which determines the screen voltage applied to that tube. This adjustment is used to compensate for possible changes in circuit constants occurring when V208 is replaced with a new tube (See paragraph 3d of section 5). The SILENCER switch (S501), when thrown to its OFF position, opens the cathode circuit of V208, thereby stopping conduction in the silencer amplifier tube and rendering the silencer circuit inoperative.

g. AUDIO FREQUENCY CIRCUITS. The three audio amplifier stages are generally conventional. Refer to the simplified schematic diagram of these

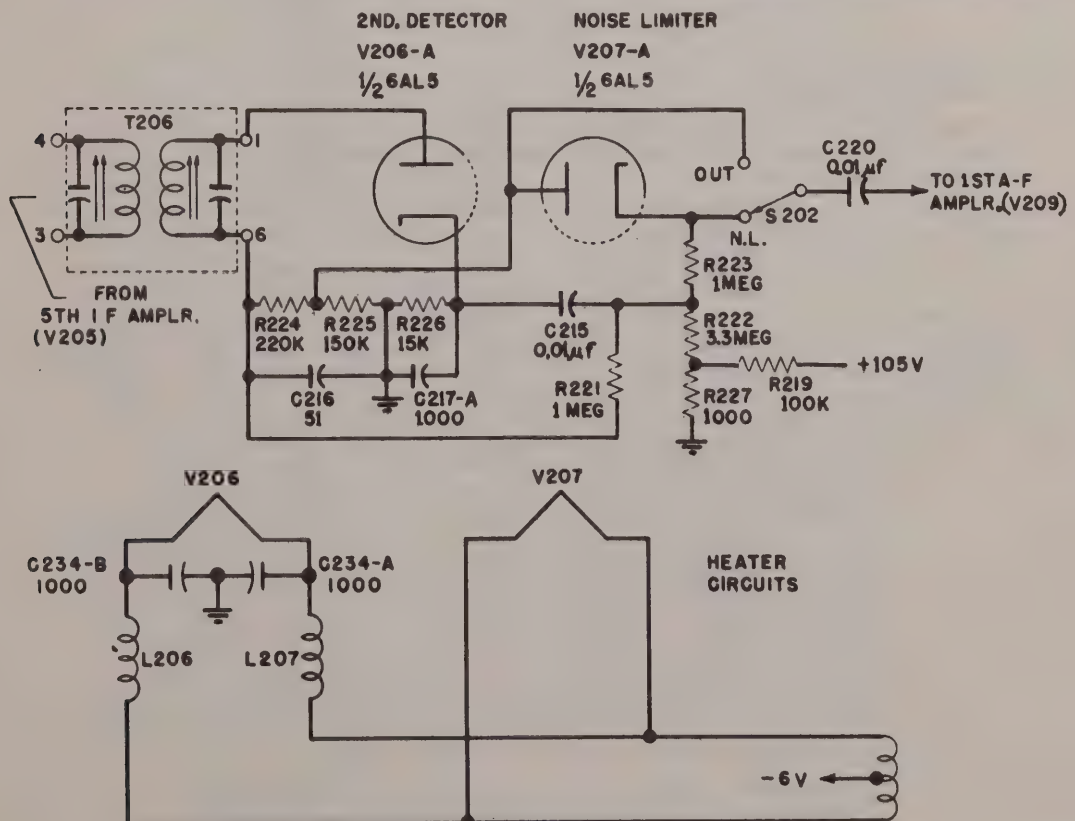


Figure 2-10. Simplified Schematic—Second Detector and Noise Limiter

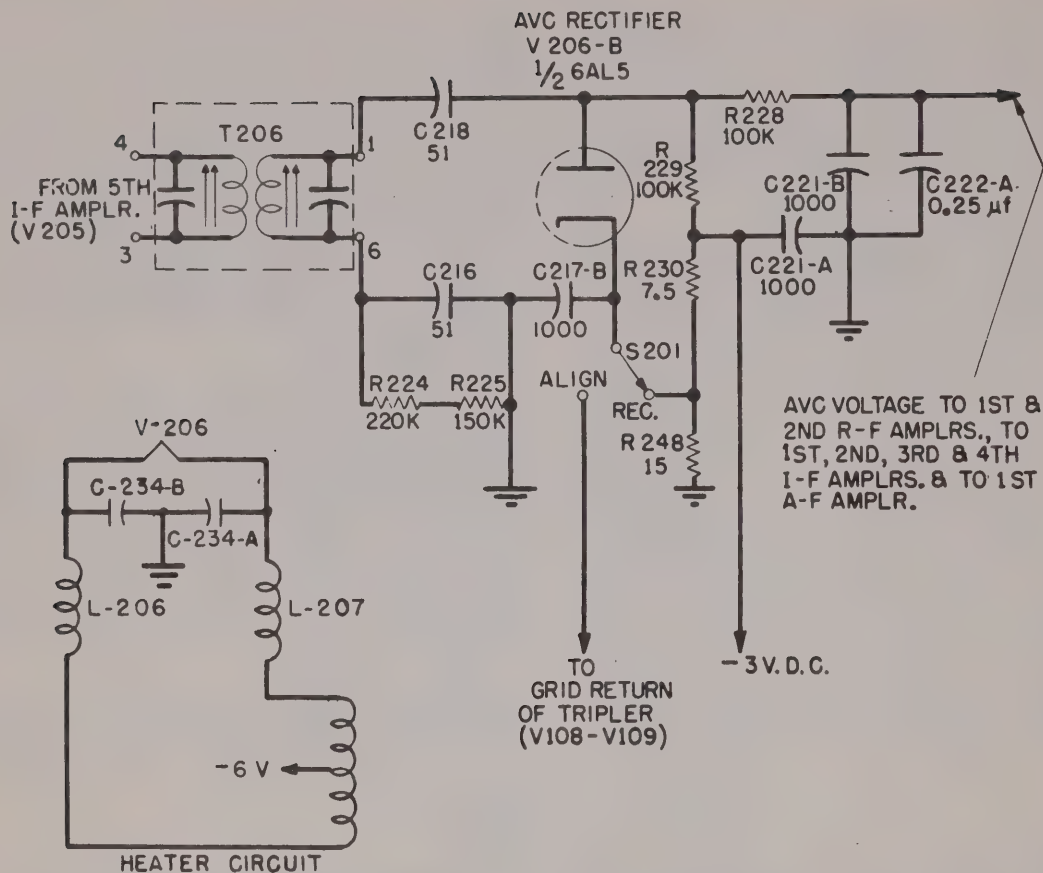


Figure 2-11. Simplified Schematic—AVC Rectifier Circuit

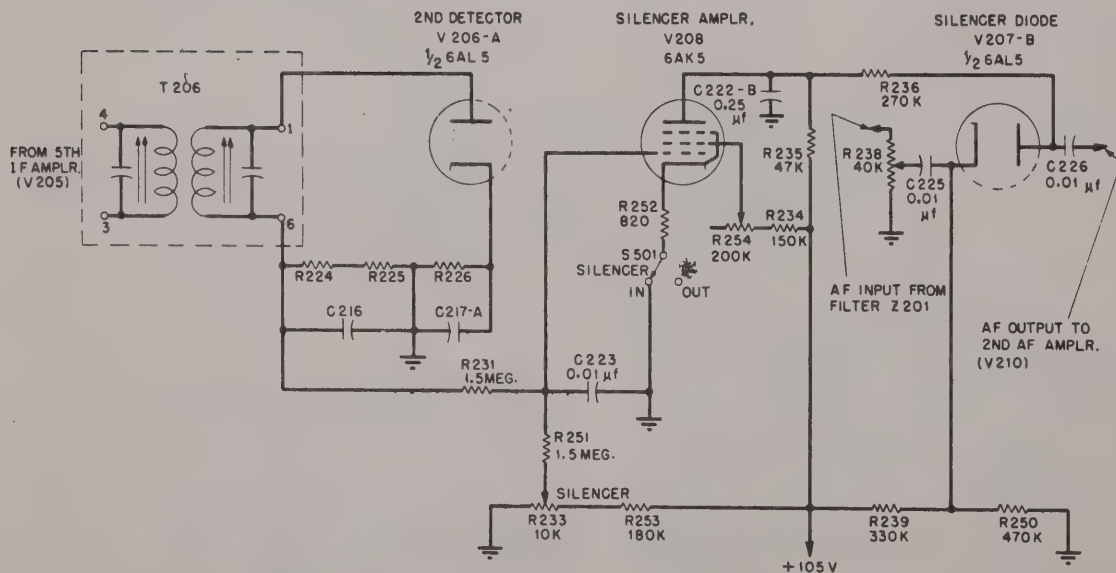


Figure 2-12. Simplified Schematic—Noise Silencer Circuit

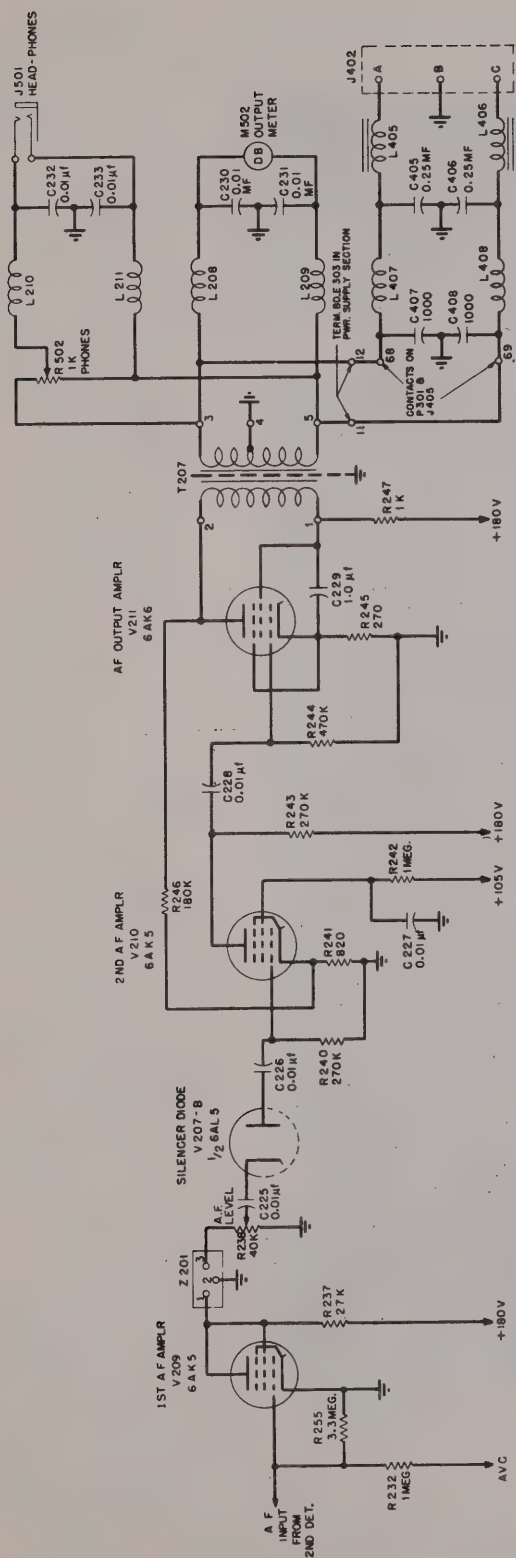


Figure 2-13. Simplified Schematic—Audio Frequency Circuits

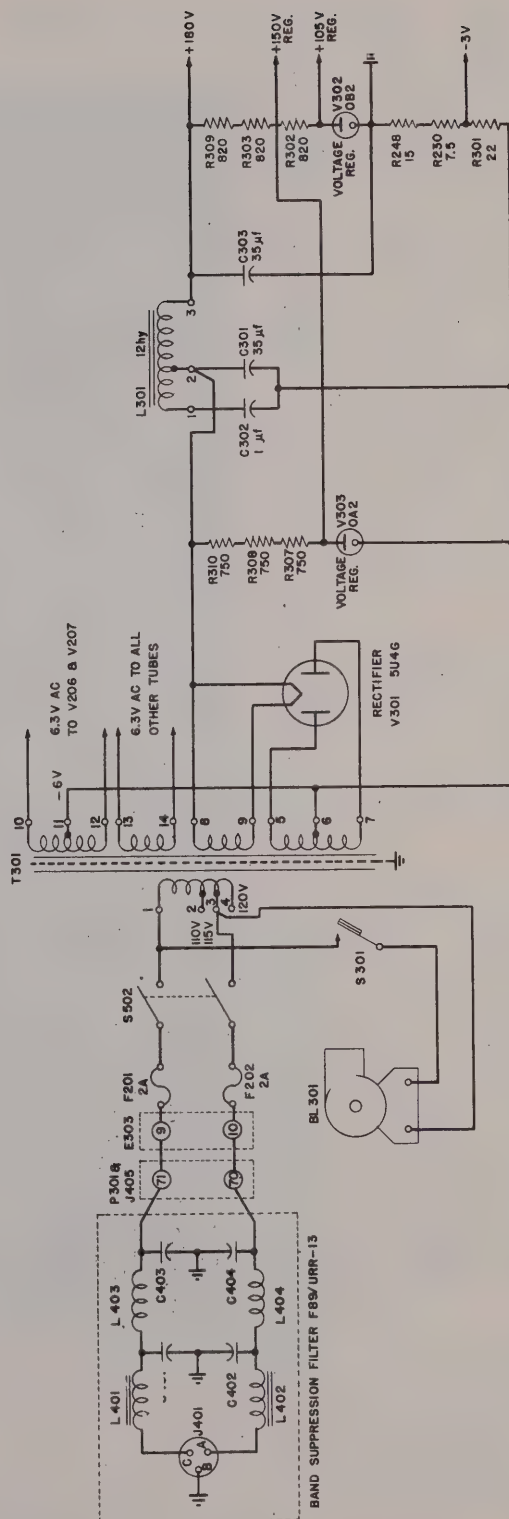


Figure 2-14. Simplified Schematic—Power Supply Section

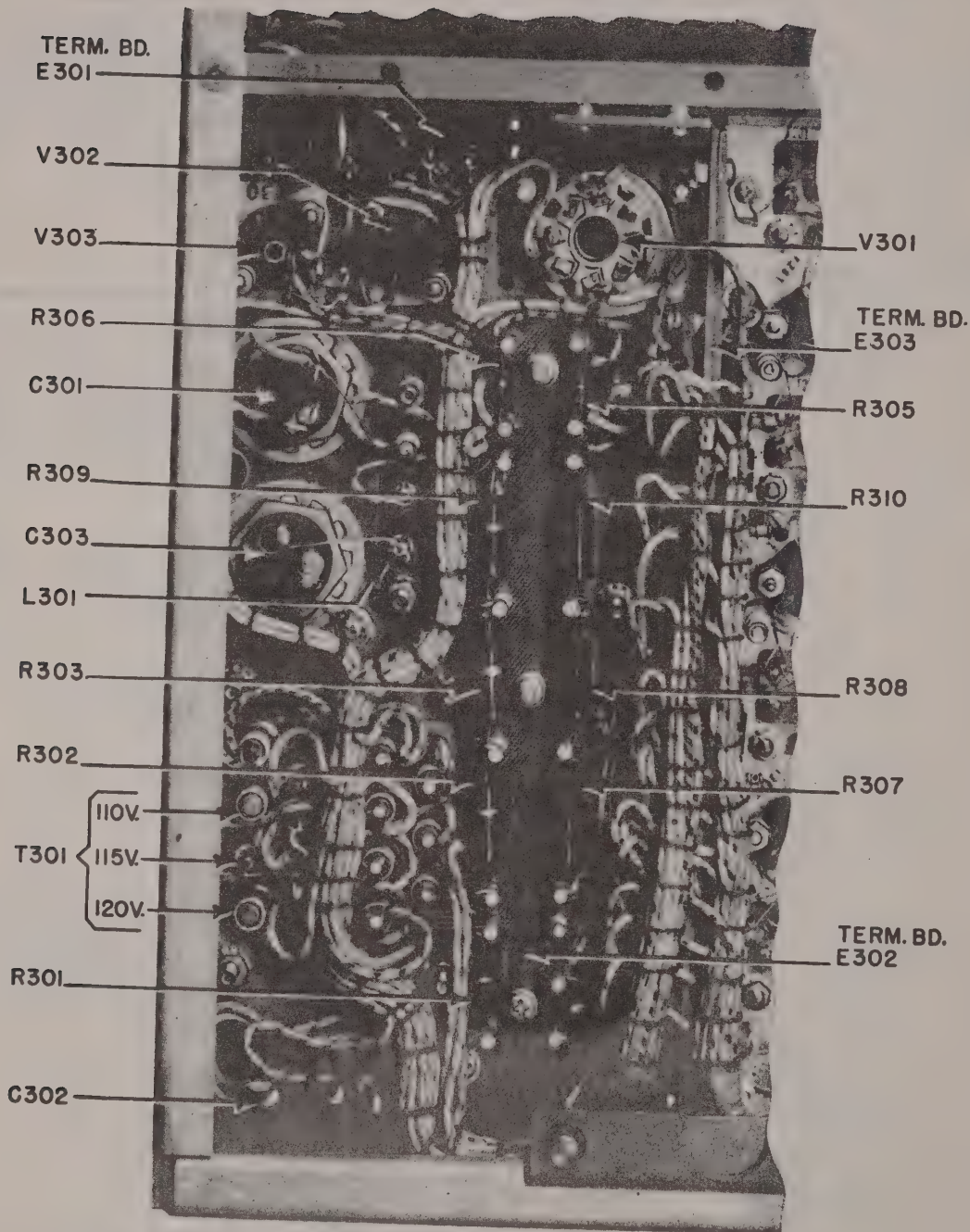


Figure 2-15. Underside of Power Supply Section

circuits, figure 2-13. The first stage is a triode-connected type 6AK5 pentode (V209) subject to AVC. Its output is fed through the 350- to 3500-cycle band-pass filter (Z201) which discriminates against undesired frequency components but transmits the required voice frequencies. The signal passes through the a-f level control, R235, and the control diode (described in paragraph f, above) to the grid of the second audio stage (V210). This stage is a conventional resistance-coupled pentode (type 6AK5) voltage amplifier with an unby-passed cathode-bias resistor. Its output drives the final type 6AK6 pentode power stage (V211) which also operates with an unby-passed cathode-bias resistor. Feedback is used from the plate of the output stage (V211) to the cathode of the preceding stage (V210) in order to maintain a constant output voltage characteristic with a variation of output load impedance, such as would result from the plugging in or withdrawing of headphones, etc.

Audio signal from the amplifier is transmitted, via the electrostatically-shielded output transformer T207, to the required output circuits. The impedance step-down of the transformer is 10,000 to 60 and the secondary provides balanced output. Signal from the secondary is fed via the r-f filter composed of L208, L209, C230, and C231 to the output meter M502. Similarly it is fed via the PHONES gain control (R502) and associated r-f filter (L210, L211, C232, and C233) to the headphones jack (J501). A third circuit transmits audio output via the connector P301/J405 for external use through the output jack J402 located at the rear of the cabinet. This line is also filtered against external r-f fields by a combination of chokes (L405, L406, L407, L408) and capacitors (C405, C406, C407, C408). This filter is a part of Band Suppression Filter F-89/URR-13.

For headphone use the front-panel PHONES volume control provides an audio level adjustment auxiliary to the main audio level control R238.

b. POWER SUPPLY. A single power transformer (T301) supplies heater power for all tubes and, after rectification, high voltage d.c. for plates and screens, as well as a small negative voltage used for bias. See the power supply explanatory schematic diagram, figure 2-14, and the photograph, figure 2-15.

(1) **FILAMENT AND HEATER SUPPLY.** Of the four secondary windings of transformer T301, three are for filament or heater power. One provides filament power at five volts for the type 5U4G rectifier, V301; a second supplies 6.3 volts for the detector, AVC, noise-limiter, and noise-silencer diodes V206A, V206B, V207A and V207B; and a third provides 6.3 volts for all other tube heaters. The center-tap of the diode heater secondary is connected to a six-volt negative potential instead of to ground. This bias on the heaters minimizes hum.

(2) **PLATE AND SCREEN SUPPLY.** The type 5U4G rectifier, V301, provides full-wave rectification of the high-voltage from the fourth transformer secondary, which is supplied at +180 volts for plates and at +105 volts for screens. A separate and regulated +150-volt output is provided for use on the local oscillator and first doubler stages of the converter circuit. Filtering is accomplished by capacitors C301, C302, C303, and the reactor L301. The inductance of the coil between terminals No. 1 and No. 2 is such that it is series-resonant at the ripple frequency in conjunction with the one mfd. capacitor C302, and thus provides a low impedance path for ripple currents. Hum is therefore minimized. The 35 mfd. input capacitor C301 and output capacitor C308 are used in the conventional manner. A type OA2 gaseous regulator tube (V303) is used with the required series resistance (R307, R308, R310) to regulate the 150-volt oscillator supply. The type OB2 regulator (V302) operates with its series resistance (R302, R303, R309, R230, R248, and R301) to regulate screen voltage at +105 volts. Plate voltage is sufficiently stable without regulation.

(3) **BIAS VOLTAGE.** Biasing voltages are obtained by operating the negative side of the rectifier output at a potential six volts below ground. This negative portion of the rectifier output is divided by resistors R248, R230 and R301 to provide a three-volt negative potential for holding bias. The full six-volt negative potential is applied to the heaters of diodes V206 and V207 to minimize hum.

(4) **PRIMARY CIRCUIT.** The primary of power transformer T301 is tapped for operation from a 110-, 115-, or 120-volt, 50-60 cps a-c line. The power supply (and therefore the receiver) is turned on or off by the front-panel POWER switch, S502, which opens both sides of the input power line. Circuit protection is provided by the two fuses, F201 and F202, which are in fuse holders mounted inside the right-hand front-panel compartment. Line power is brought to the power supply via the connector P301/J405 from the filter box (Band Suppression Filter F-89/URR-13) and input receptacle J401 at the rear of the receiver. The circuit is filtered against external r-f fields by the two-section filter composed of chokes L401, L402, L403, and L404, and capacitors C401, C402, C403, and C404. The latter are contained in Band Suppression Filter F-89/URR-13.

(5) **BLOWER AND THERMOSTAT.** The blower BL301 is mounted in the power supply section and is used to keep the operating temperature inside the receiver within satisfactory limits. It is controlled by the thermostat S301, which automatically turns on the blower whenever the inside ambient temperature reaches 60°C.

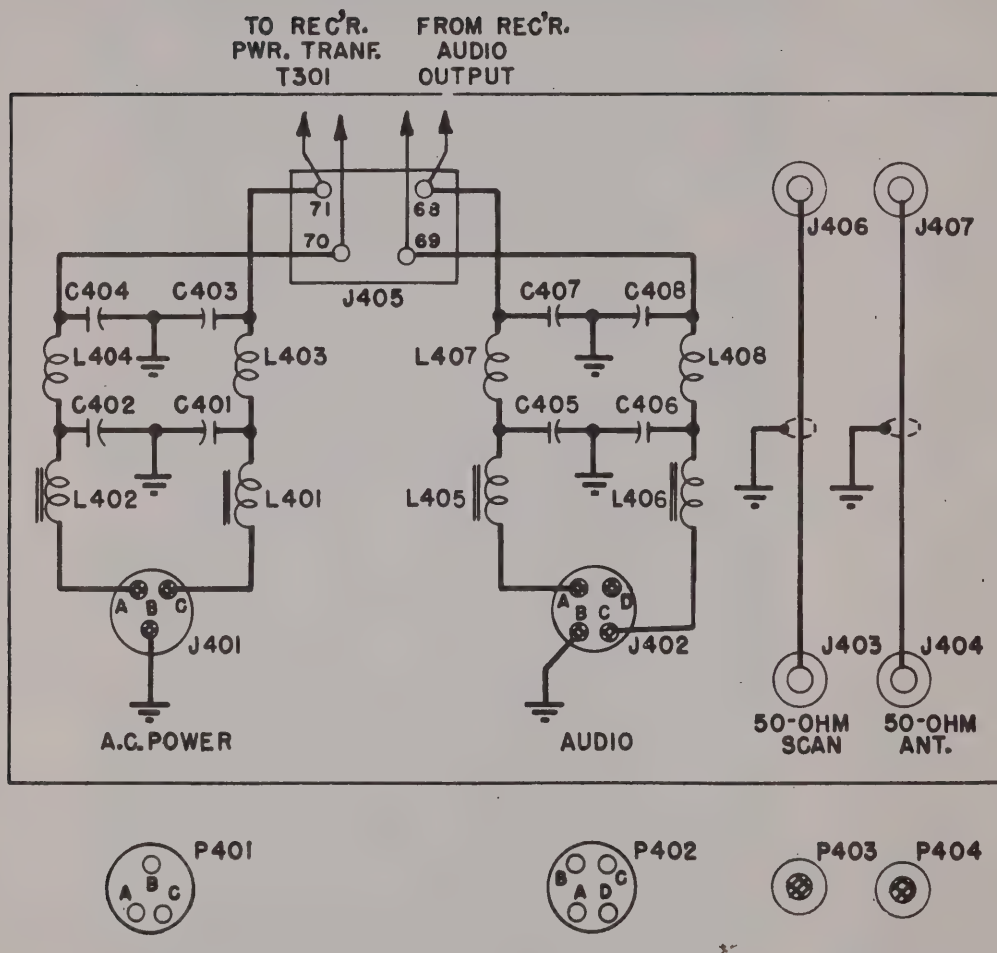


Figure 2-16. Simplified Schematic—Band Suppression Filter F-89/URR-13

SECTION 3
INSTALLATION AND INITIAL ADJUSTMENTS

1. INSTALLATION DRAWINGS.

A list of drawings useful in connection with the installation of the equipment, and reproduced in this

book, is given in table 3-1 below, together with contractor's drawing numbers and instruction book figure numbers.

TABLE 3-1. INSTALLATION DRAWINGS

Item No.	Subject of Drawing	FTRC Drawing No. & Size	Instruction Book Figure Number
1.	Outline Drawing—Radio Receiver R-266/URR-13	FRE-19942-26	3-9
2.	Outline Drawing—Preselector	FRE-26117-14	3-10
3.	Outline Drawing—Band Suppression Filter F-89/URR-13	FRE-19968-12	3-11
4.	Outline Drawing—Relay Rack Mounting Brackets	FRJ-27474-12	3-7
5.	Outline Drawing—Repair Parts Box	FRE-26630-2	3-8
6.	Interunit Connection Diagram	FRJ-27821-2	3-4
7.	Block Diagram—Complete Receiver	FRJ-27481-3	2-1
8.	Overall Schematic Diagram—Radio Receiver R-266/URR-13	FRD-21171-26	7-17
9.	Wiring Diagram—Receiver Chassis	FRD-20430-26	7-18
10.	Wiring Diagram—Preselector	FRD-20324-14	7-19

2. UNPACKING THE EQUIPMENT.

a. GENERAL.

Each complete Radio Receiving Set AN/URR-13 is shipped in a single wooden crate with the receiver and accessories in one end and the spare parts and spare parts chest in a compartment at the other end. The items comprising a complete AN/URR-13 equipment are listed in table 1-1.

The method of packing the equipment is shown in figure 3-1. The receiver is separated from the walls of the inner paper carton by suitable paperboard spacers, and paperboard collars are used to protect the dials on the front of the cabinet and the cable filter (Band Suppression Filter F-89/URR-13) on the rear. The two angle brackets provided for use when the receiver is to be mounted on a relay rack are inserted in the voids of the top spacer, and the four connector plugs provided for use on external inter-connecting cords are included in a separate cloth bag. The two copies of the instruction book are wrapped in a separate package which is placed on top of the top spacer.

The inner carton is placed inside a second carton and separated from it by a moisture-vapor-proof barrier. The outer carton is placed inside the larger

compartment of the wooden crate and separated from it by a water-proof box liner. The moisture-vapor-proof barrier and the water-proof box liner are heat sealed at the time the equipment is packed for shipment.

To unpack the equipment:

1. Remove the top panel of the crate using a nail puller.
2. Cut open the water-proof box liner.
3. Break sealing tape and open the outer cardboard carton.
4. Cut moisture-vapor-proof barrier between outer and inner carton.
5. Break sealing tape and open the inner cardboard carton.
6. Lift out instruction books.
7. Lift out top paperboard spacer.
8. Remove relay rack mounting brackets from void spaces in this piece.
9. Locate and remove bag containing four connectors (P401-P404).
10. Remove silica gel bags (28) from recesses in side paperboard spaces.
11. Lift out receiving set.

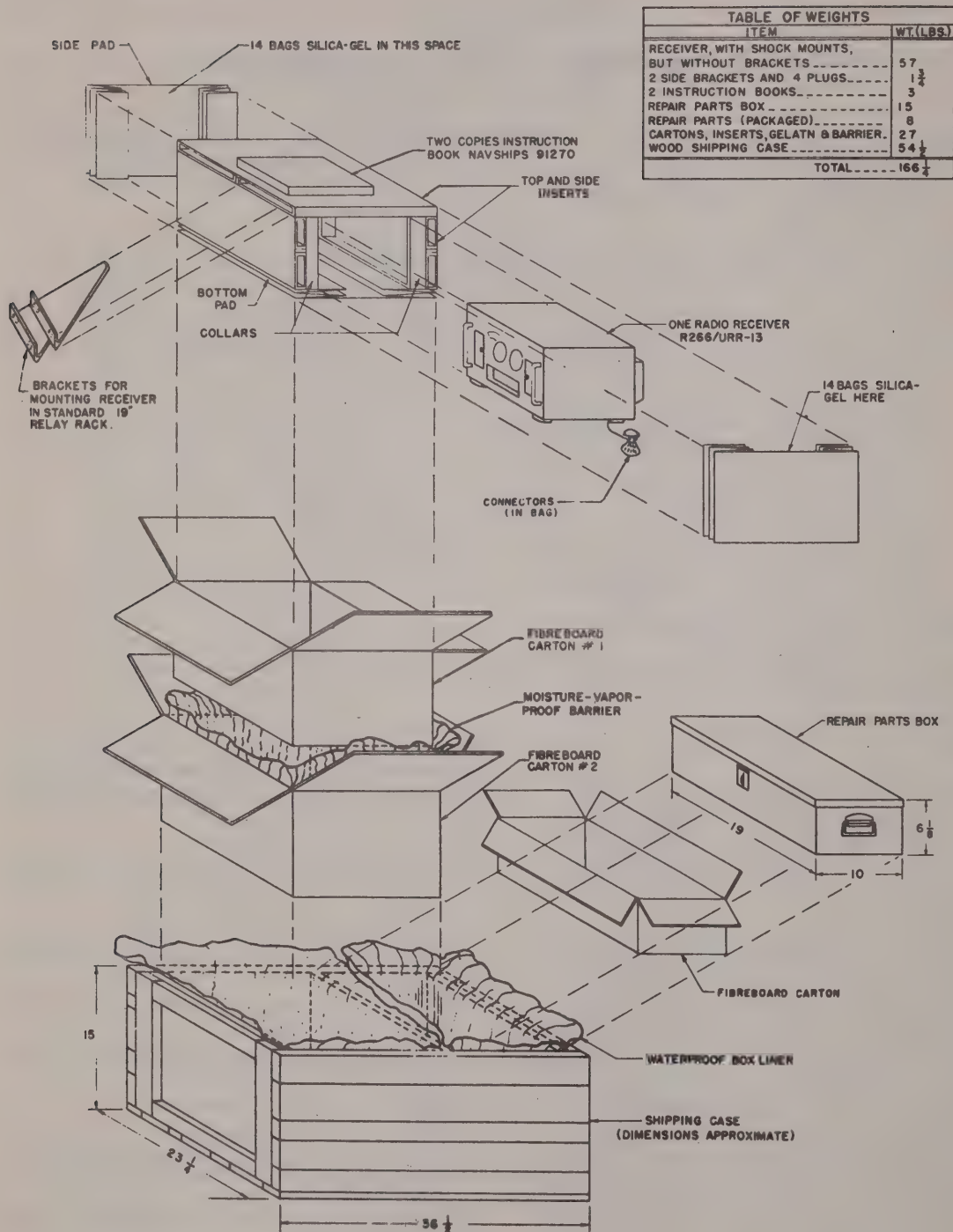


Figure 3-1. Method of Packing Radio Receiving Set, AN/URR-13

12. Discard paperboard collars protecting front and rear of receiver.
13. Cut waterproof box liner in smaller compartment of shipping crate.
14. Lift out repair parts chest.

b. RE-INSTALLATION OF RECTIFIER TUBE.

The only part removed from its normal location for shipment is the large type 5U4G rectifier tube (V301). This tube is wrapped in several thicknesses of Kimpak batting and placed on the receiver chassis within the receiver cabinet.

To remove the chassis from the cabinet loosen the four fasteners in the extreme corners of the front panel, by giving each a quarter-turn to the left, and pull the chassis forward until the spring-actuated stops on the bottoms of the side rails prevent further travel; then release these stops (one on each side) by pressing them upward and pull the chassis completely out of the cabinet (figure 5-1). To remove Band Suppression Filter F-89/URR-13 from the rear of the cabinet, reach inside the cabinet to the back (see figure 3-3) and squeeze together the handles of the pairs of snap-slide fasteners located at the top, at the bottom and at each side of the rear wall.

To restore tube V301, loosen the tube clamp (attached to chassis), in closed position, by flipping toggle; insert the tube, and then tighten the tube clamp toggle, using a screwdriver shaft if the space is too cramped for the fingers.

c. MECHANICAL CHECK.

The equipment should be inspected for possible damage or disarrangement during shipment. Check to see that no nuts, washers, bits of solder or other foreign particles have become lodged where they might cause a short circuit, and tighten any screws or nuts which may have worked loose. A careful search should also be made for broken wires and loose connections since a detailed mechanical inspection at this time may save much inconvenience in the long run. All mechanical controls should be operated in each alternate position, or through their full range of travel, in order to detect any bent shafts or other evidences of abnormal operation. Also check to see that all tubes are well seated in their sockets, that all tube shields are firmly in place, and that fuses F101 and F102 are in their holders, and the holders in place, in the right-hand panel compartment.

Note

The latest approved installation instructions should be followed irrespective of the information given in this section.

3. INSTALLATION.

a. LOCATION OF EQUIPMENT.

In locating the receiver consideration should be given to the accessibility of a suitable source of 110-120-volts, 60 cps power, of the antenna lead-in, and of any supplemental equipment which may be employed. It should be located where adequate fresh clean air is

available for ventilation. Also, clearances should be adequate to permit removal of the chassis from the cabinet, and to permit access to tubes and adjustments in the preselector without complete removal of the chassis.

The receiver is shipped with four shock mounts attached ready for installation on a table or bench. These should be removed and the angle brackets attached to the cabinet in their stead if the receiver is to be installed in a standard relay rack.

(1) TABLE OR BENCH MOUNTING.

If the receiver is to be set up on a bench or table, and the installation is to be more than temporary, it should be bolted in place. To do this remove the receiver chassis from the cabinet, locate the cabinet in the desired permanent position and drill four $\frac{3}{8}$ " diameter holes in the bench, in line with the centers of the shock mounts. Next drop a $\frac{5}{16}$ " diam. bolt through the hollow core of each shock mount and the hole in the bench below it, and thread on a nut against a suitable washer from the underside. These nuts should be drawn up tight, but not tight enough to place the shock mounts under compression; then a second nut should be added and jammed tight against the first to prevent loosening.

Before dropping the mounting bolts through the shock mounts make sure that the phosphor-bronze ground strap provided is located in the hollow of one of the shock mounts so that the bolt passing through that shock mount will also pass through the large hole in one end of the strap. The other end of the strap should be fastened to the bottom of the cabinet by one of the four screws securing the shock mount involved.

(2) RELAY RACK MOUNTING.

If the receiver is to be mounted on a standard relay rack, it will be necessary to remove the four shock mounts from the bottom of the cabinet and to attach the two angle brackets provided to the sides of the cabinet (see figures 3-2 and 3-7). The shock mounts can be taken off by merely removing the bolts in the corners of their flange plates. The angle brackets are symmetrical in shape and are attached one to each side of the cabinet by means of No. 8-32 x $\frac{1}{2}$ " long Phillip's head machine screws. Five holes in each bracket line up with five tapped holes in each side of the cabinet. The required screws will be found threaded into the tapped holes in the cabinet. Removal of the shock mounts will also cause detachment of the phosphor-bronze grounding strap which is ordinarily connected between one of the shock-mount mounting screws and the $\frac{5}{16}$ " diam. cabinet mounting bolt which drops through the hollow core of the shock mount. This strap will not be needed for relay rack mounting, but should be put in safe keeping for possible future use.

b. EXTERNAL CONNECTIONS.

External connections are made to suitable connectors on the rear of Band Suppression Filter

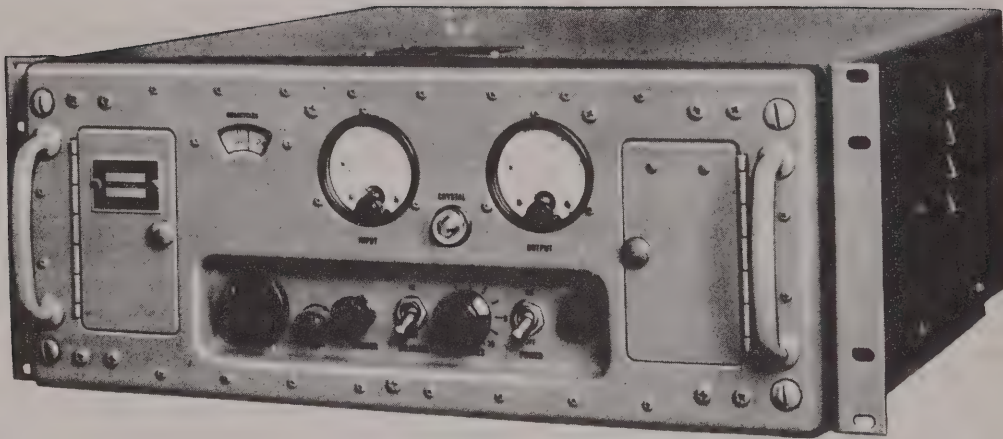


Figure 3-2. Front View, Shock Mounts Removed, Relay Rack Mounting Brackets Attached

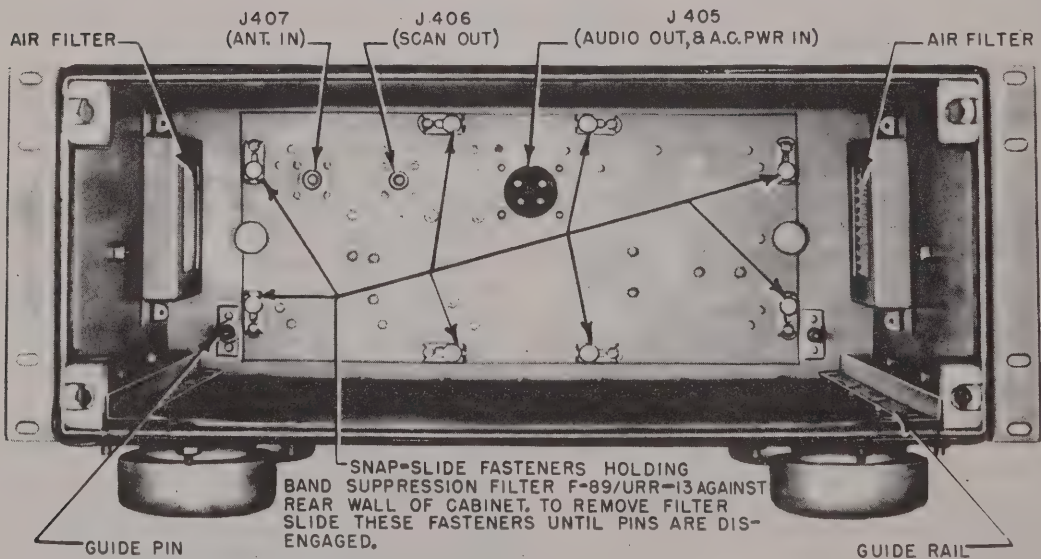


Figure 3-3. View into Cabinet Showing Front of Band Suppression Filter F-89/URR-13, and Method of Attachment of Same to Cabinet

F-89/URR-13, on the rear of the receiver chassis. Cables for making external connections to the receiver are not supplied, but connectors (plugs) suitable for

use with such cables are provided. The types and functions of these plugs are indicated in figure 3-4, and summarized in table 3-2 below.

TABLE 3-2. CONNECTORS (PLUGS) SUPPLIED WITH AN/URR-13
EQUIPMENT FOR MAKING EXTERNAL CONNECTIONS

Circuit Symbol of Plug	Circuit Symbol of Mating Receptacle	Circuit in Which Used	Type Wire or Cable to be Used with Plug	Plug Type (and/or FTRC Dwg. Number)
P401	J401	110-120 v, 60 cps power input	MCOS-2	AN-3106-14s-7S + AN-3057-6 cable clamp (FRE-24367-1-1)
P402	J402	Audio output to interphone, or other audio listening device(s).	TTHFWA-1	AN-3106-14s-2S + AN-3057-6 cable clamp (FRE-24367-1-2)
P403	J403	50-ohm scan output (to panoramic adapter, if used)	AN Type RG-8/U Coaxial	Navy Type (—49195)
P404	J404	50-ohm antenna input	See applicable installation drawing	AN Type UG-21B/U

Procedures for making up cables from coaxial transmission line and coaxial connectors are shown in figures 3-5 and 3-6.

The plug provided for the power cable (P401) has three female contacts. Contacts A and C connect to the a-c line and contact B to ground. Pins A and C on the 4-contact audio output connector (P402) provide a balanced output connection for any audio frequency load having an impedance between 60 and 600 ohms. Pin B of this connector is connected to ground, and Pin D is unused.

The ground lug on the back of the band suppression filter, between receptacles P403 and P404, should be connected to the station ground via a short length of copper braiding, not less than 1/2" wide.

The power input receptacle (J401) is wired to the primary of power transformer T301 through the band suppression filter. The primary of this transformer is tapped to permit operation of the receiver from a 60 cps power source of 110, 115 or 120 volts potential (see figures 2-15 and 2-14). Terminals 1 and 2 should be used for a 110-volt input, terminals 1 and 3 for a 115-volt input and terminals 1 and 4 for 120-volts. In the equipment, as shipped, this transformer is wired for 115-volt operation.

c. PREPARATION FOR OPERATION.

(1) GENERAL.

(a) If not already in place, insert the crystal required for the desired channel of operation in the crystal holder in the left-hand compartment of the front panel. The correct crystal frequency to be used

can be determined from this formula:

$$\frac{\text{Crystal frequency (in Mc.)} = \text{selected channel frequency (in mc.)} + 18.6 \text{ mc.}}{12}$$

(b) Connect one end of the a-c power cable to the A.C. POWER receptacle on the rear of the set, and the other end to a source of 115-volt, 60 cps power (or to a 110-volt or 120-volt source if connection has been made to proper tap on primary of transformer T301, as explained above).

(c) Connect cable from transfer panel or speaker-amplifier to AUDIO receptacle on rear of set.

(d) Connect antenna lead-in plug to 50-OHM ANT. receptacle on rear of set.

(e) Position the receiver controls as follows:
CRYSTAL-MANUAL switch S203 (in left compartment)—in CRYSTAL position.

N. L. (noise limiter) switch S202 (in rt. compartment)—in OUT position.

SILENCER switch S501—in OUT position.

A.F. LEVEL control R238 (screwdriver; rt. compartment)—maximum (full clockwise) position.

ALIGN-REC. switch S201 (in left compartment)—in REC. position.

PHONES control R502—in position "8".

(f) Throw POWER switch S502 to its ON position. After about four seconds the neon panel lamp marked CRYSTAL (I503) should light indicating that the receiver is under crystal control and that plate (B+) power is on. If the panel is not illuminated properly, use DIMMER control R501 to bring lamps

I501 and I502 up to the desired brilliance. After about two minutes warm-up time loosen the LOCK knob beside the tuning control and proceed to tune for the selected channel frequency.

(2) CRYSTAL CONTROLLED TUNING.

Rotate the tuning control crank until the selected channel frequency appears on the calibrated dial visible through the window above, marked MEGACYCLES. This frequency will be equal to 12 times the crystal output frequency, less 18.6 megacycles. The dial reading will indicate approximate tuning. With no signal coming into the receiver the exact setting is obtained by tuning for a maximum reading (maximum "noise") on OUTPUT meter M502. Under this condition INPUT meter M501 should read zero. If it does not it should be so adjusted by means of IMP. MTR. potentiometer R214 in the right-hand compartment. The equipment is now ready for operation as a crystal-controlled receiver.

If desired, SILENCER switch S501 may now be thrown to its IN position and the SILENCER control (R233) knob in the right compartment adjusted for the desired silencing level. If the noise level is excessive when a signal is being received, the N. L. switch (S202) in the right-hand compartment may be thrown to its IN position. Use of the noise limiter circuit will cause a drop of about three db in the reading on OUTPUT meter M502. With no signal the level indicated on M502 should be between—5db and + 10db

Note

Because a harmonic mode crystal is used to control the oscillator circuit, it is possible that, at the frequencies mentioned below, resonance peaks will be observed at two different points in the frequency range when the receiver is being tuned for a maximum indication on the output meter (M502).

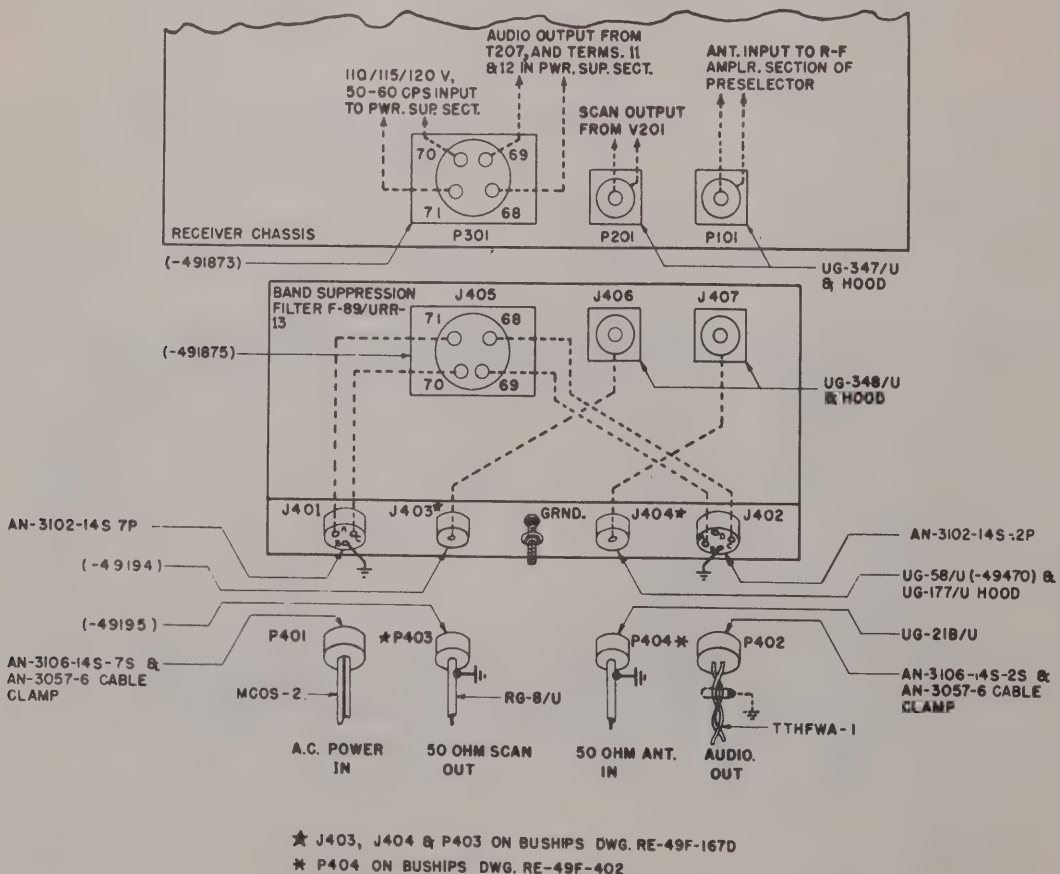


Figure 3-4. Locations of Connectors, and of I-f and R-f Cables

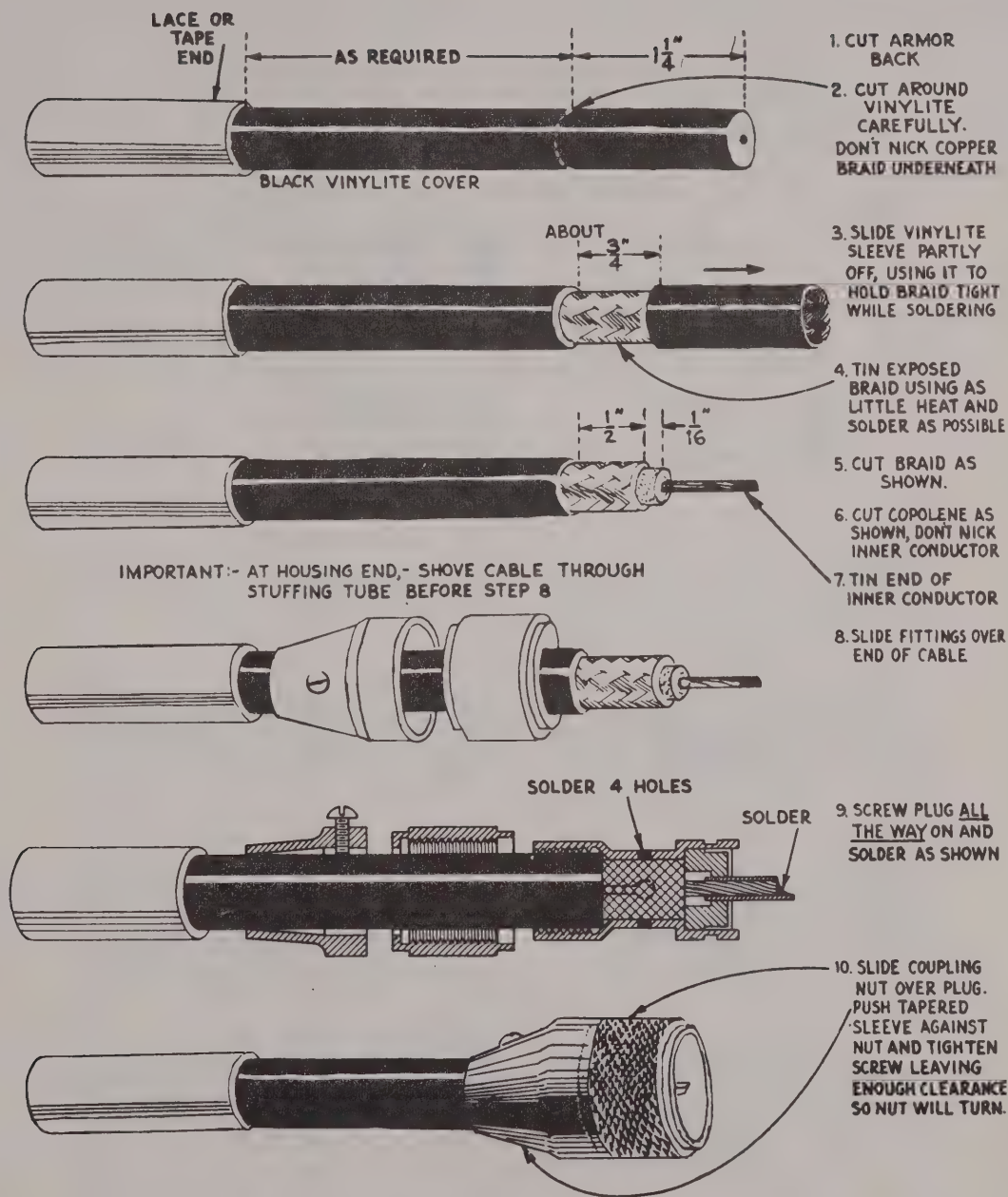


Figure 3-5. Method of Assembling Plug P403 (Navy Type—49195) to AN Type RG-8/U Coaxial Transmission Line to Form SCAN Output Cable

CABLE ASSEMBLY INSTRUCTIONS For A and B TYPE CONNECTORS

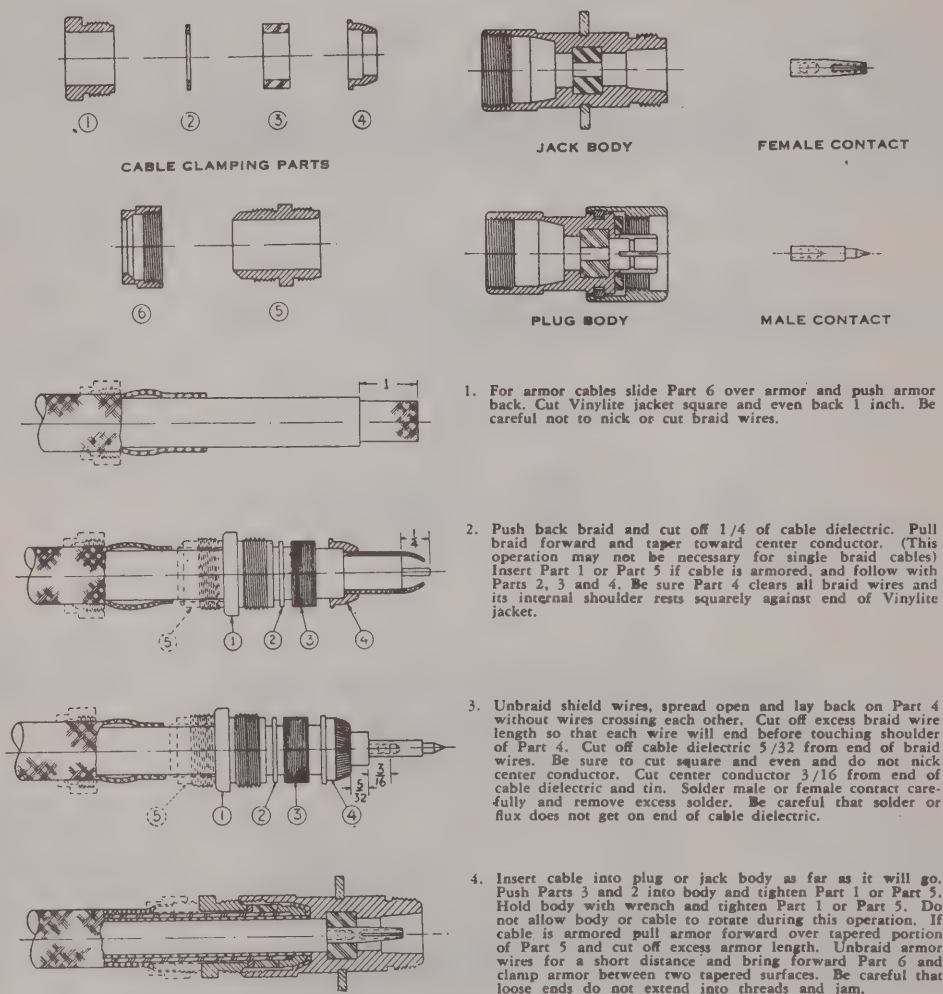


Figure 3-6. Method of Assembling Plug P404 (AN Type UG-21B/U) to AN Type Coaxial Transmission Line to Form ANTenna Input Cable

When tuning to a channel within the frequency range of 225-233 megacycles, the second response would occur at the high frequency end of the band, between 387 and 400 megacycles. Conversely, when tuning to a channel within the frequency range of 387-400 megacycles, the second response would occur at the low frequency end of the band, between 225 and 233 megacycles.

To prevent incorrect tuning of the receiver in the 225-233 and 387-400 megacycle ranges the calibrated dial should be set, visually, at the approximate frequency of the desired channel, then the final adjustment made by peaking the output meter for maximum noise indication.

(3) MANUALLY CONTROLLED TUNING.

To operate the equipment as a continuously-

variable manually-tuned receiver throw the CRYSTAL-MANUAL switch (S203) in the left-hand compartment to its MANUAL position. This will cause the neon panel lamp marked CRYSTAL (I503) to go out. The receiver may now be tuned to any frequency within the 225-400 mc range by operation of the single tuning control crank, as for crystal-controlled tuning. The sensitivity of the receiver is approximately the same for either crystal controlled or manual tuning and will be greater than eight microvolts for a 10 db signal-to-noise ratio over the entire range.

(4) SCAN OUTPUT.

This output is used for operation of a panoramic adapter.

For instructions on the use of such equipment, consult the manual supplied with it.

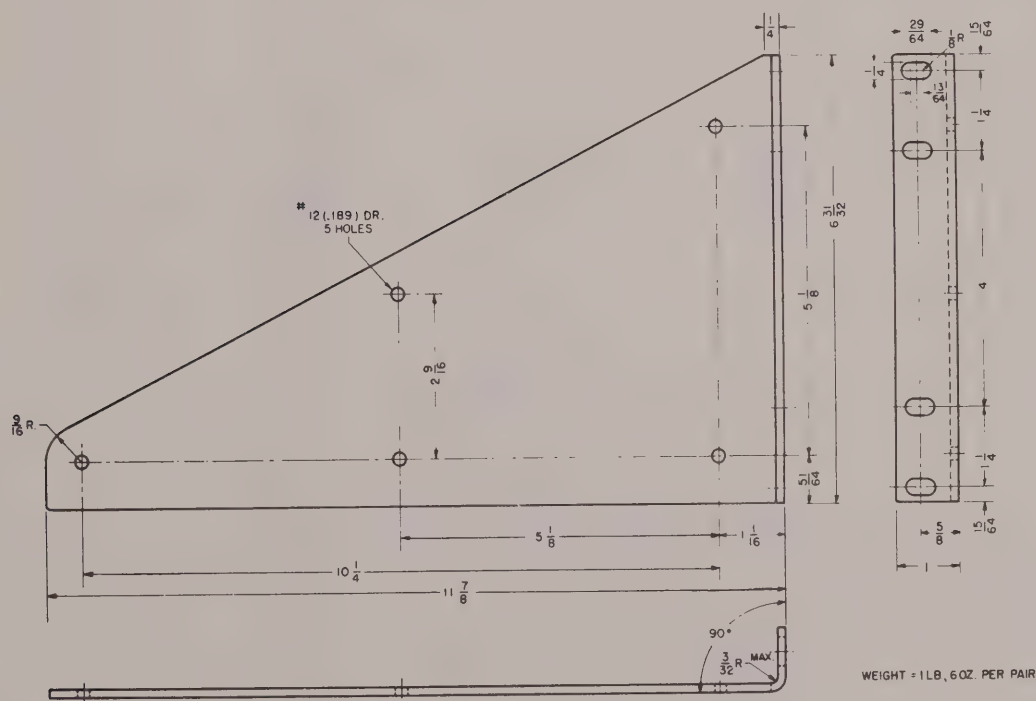
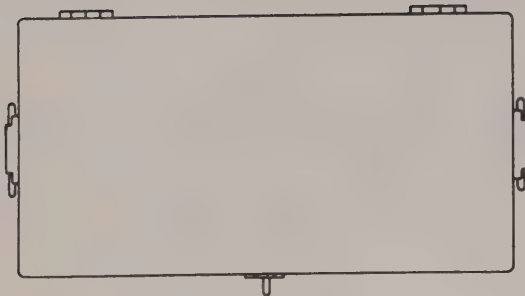


Figure 3-7. Outline Drawing—Relay Rack Mounting Brackets



WEIGHT (APPROX.) OF BOX
& CONTENTS = 23 LBS.

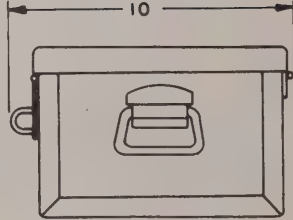
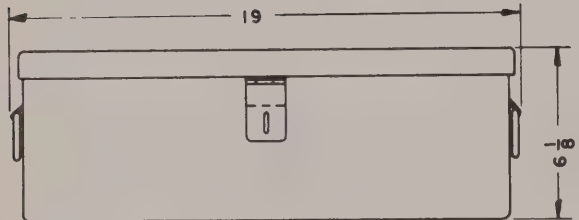


Figure 3-8. Outline Drawing—Repair Parts Box

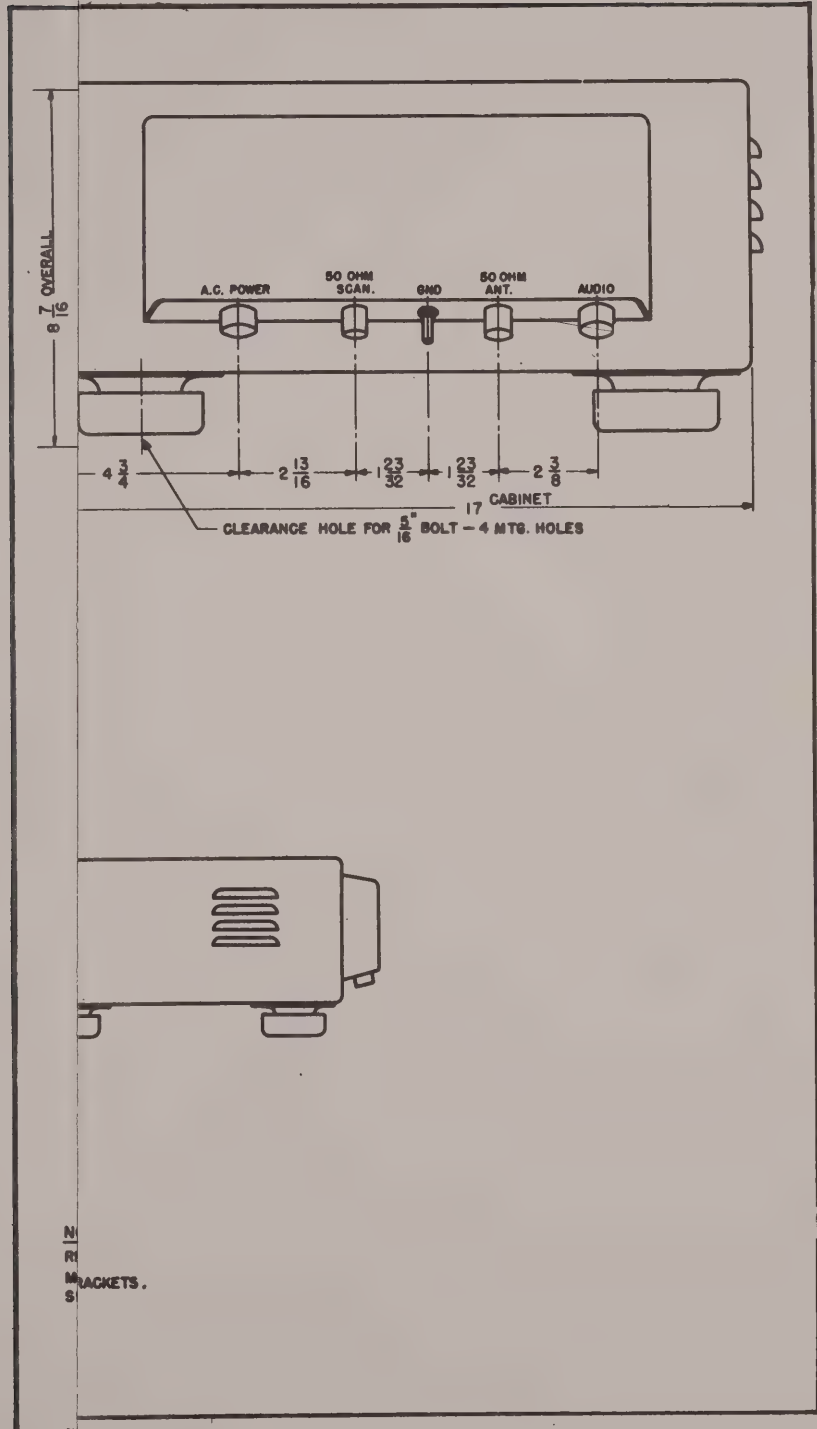
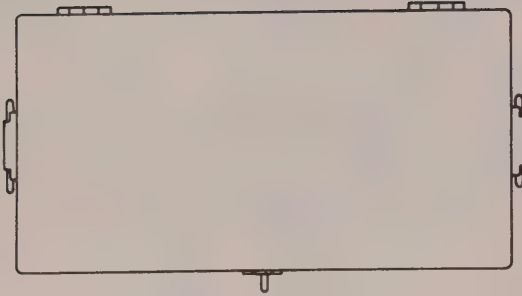


Figure 3-9. Outline Drawing—Radio Receiver R-266/URR-13

NAVSHIPS 91270
AN/URR-13
MOUNTING BRACKETS.



WEIGHT (APPROX.) OF BOX
& CONTENTS = 23 LBS.

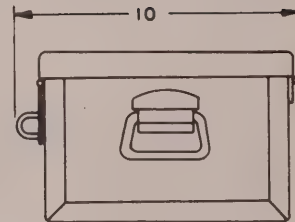
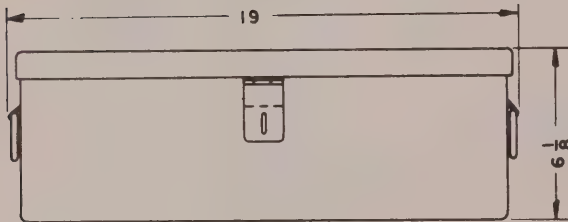
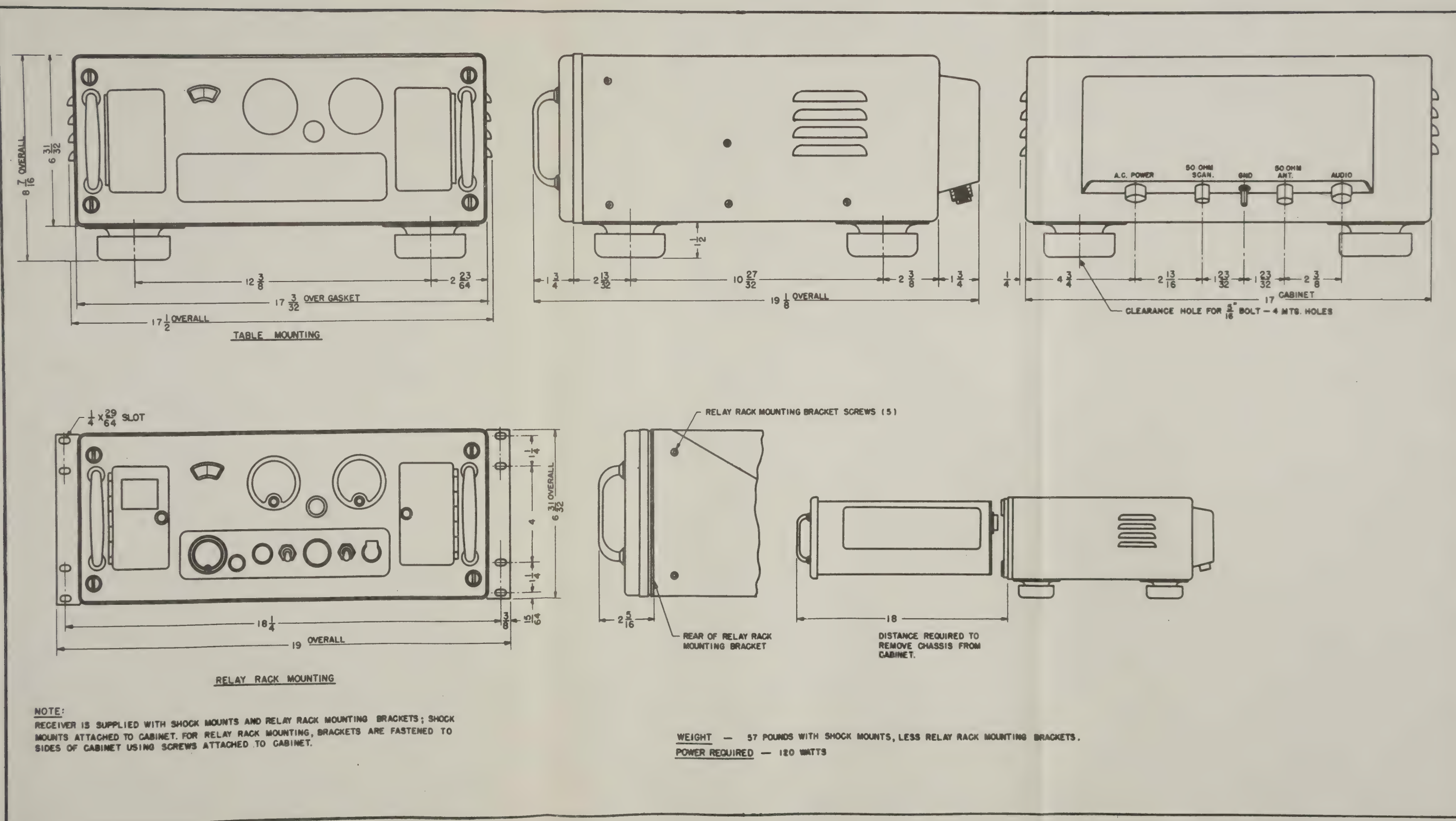


Figure 3-8. Outline Drawing—Repair Parts Box



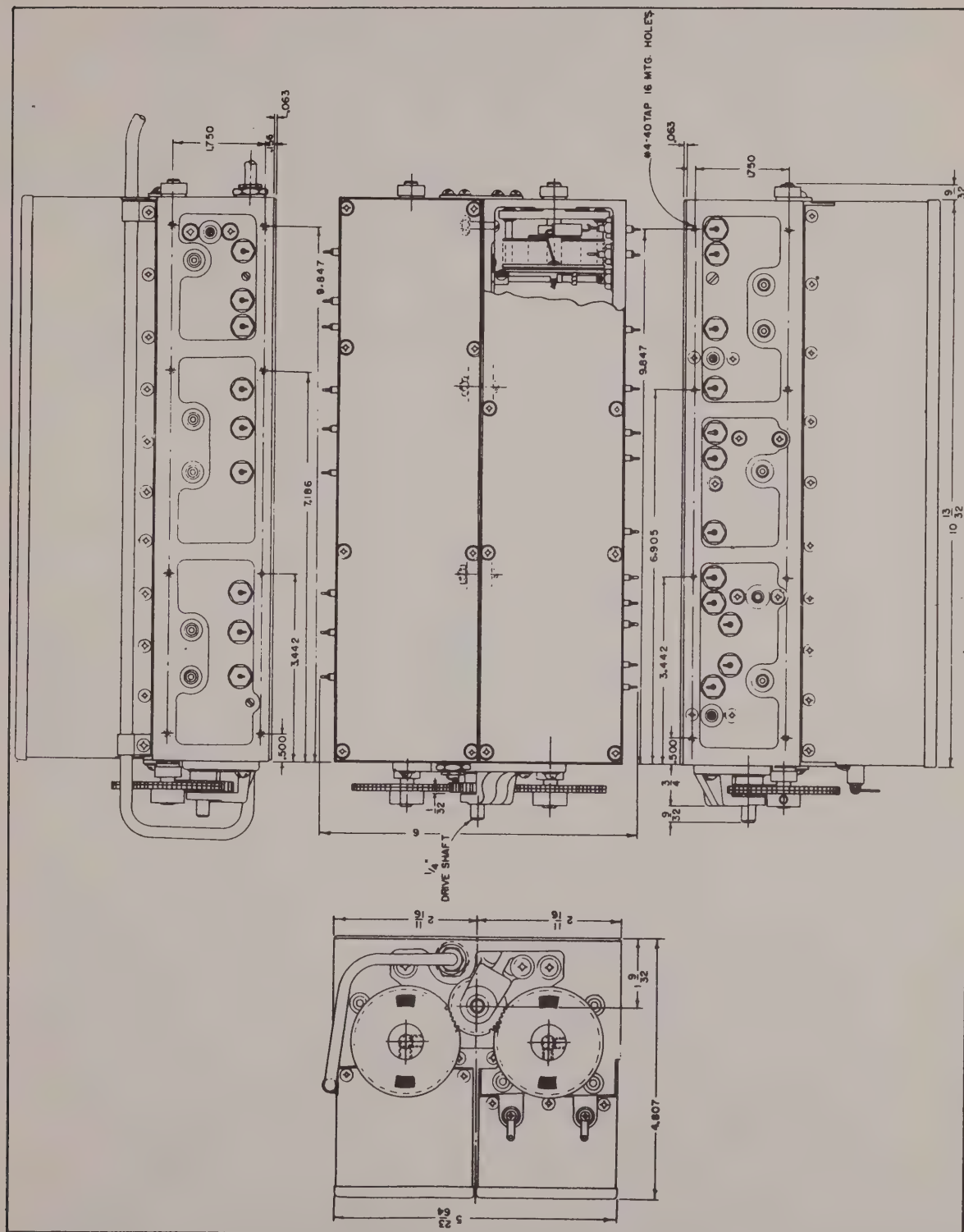


Figure 3-10. Outline Drawing—Preselector

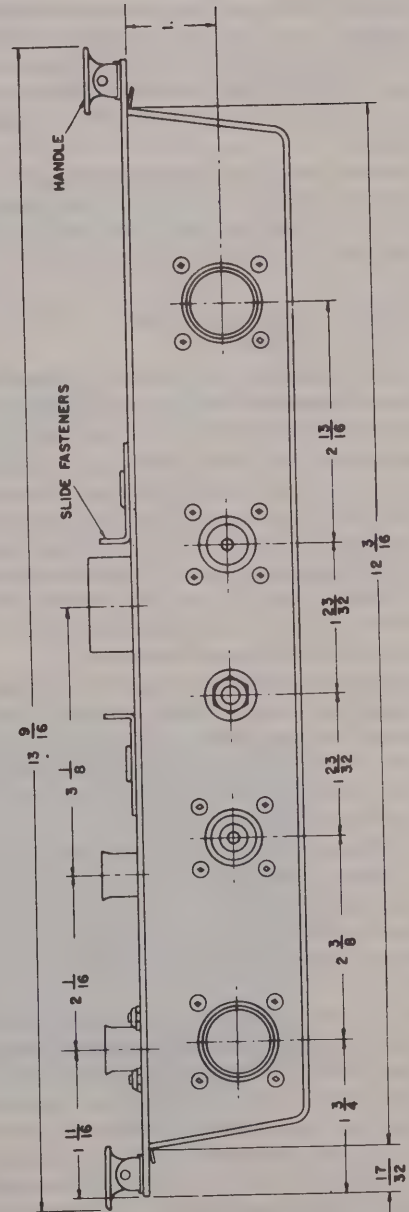


Figure 3-11. Outline Drawing—Band Suppression Filter F-89/URR-13

SECTION 4 OPERATION

1. PRELIMINARY.

It is assumed that before being turned over to the operating personnel the AN/URR-13 equipment will have been installed, and all necessary adjustments made according to instructions given in section 3. It is also assumed that those frequencies to which the receiver is likely to be tuned will have been determined and that suitable crystals for those frequencies will be ready at hand (if crystal-controlled tuning is to be employed).

The operator should be familiar with all controls on the panel of the receiver, and in the panel compartments, and should be able to tune his receiver to any channel in the 225-400 megacycle range of the equipment.

2. CONTROLS PROVIDED AND THEIR LOCATIONS.

The panel location of all controls is described in section 1, and illustrated in figure 4-1. The functions of all controls are described fully in section 2.

In general, the most used controls are recessed in the lower part of the central portion of the front panel, while the crystal and little used adjustments are enclosed in the two compartments on either side. The input and output meters, the panel lamp which indicates crystal operation, and the viewing window for the calibrated tuning indicator are flush with the front panel above the recessed section.

The primary controls are, from left to right, the tuning crank, and tuning LOCK beside it, the DIMMER control for the tuning indicator lamps, the SILENCER IN-OUT switch, the PHONES audio level control and the POWER ON-OFF switch. The PHONES jack is to the right of all these.

In the left-hand compartment, from bottom to top, are the crystal holder, the CRYSTAL-MANUAL switch used to transfer from crystal-controlled to manually-controlled tuning, and, above these, a switch to be thrown by maintenance personnel when aligning the receiver.

In the right-hand compartment, from bottom to top, are the A.F. LEVEL control used to adjust audio level at the AUDIO output connector J402, the SILENCER control used to adjust the threshold at which automatic noise silencing takes place, the noise limiter (N.L.) IN-OUT switch, the fuse-holders for fuses F201 and F202 and the IMP MTR zero adjustment control. A spare fuse (F203) is mounted in clips on the inside of the compartment door.

3. MODES OF OPERATION.

a. MANUALLY-CONTROLLED TUNING.

With manually-controlled tuning the receiver can be tuned continuously over the entire 225-400 megacycle range in the manner of any standard super-heterodyne receiver. This range is covered by 19 complete turns of the tuning crank which stops automatically at each end of the tuning range. As the crank is rotated, the frequency to which the receiver is tuned is indicated on a calibrated dial which is apparent through the viewing window in the panel above. No adjustments other than rotation of the crank are necessary, though it may be desirable at times to adjust the volume control, or to cut the noise limiter circuit in or out.

b. CRYSTAL-CONTROLLED TUNING.

Crystal-controlled tuning allows the receiver to be tuned, at any given time, to only the channel determined by the crystal installed in the crystal holder in the left-hand compartment. However, this mode of operation has the advantages of stability and freedom from drift, and an inherent capacity for sharper tuning. The essential difference between the two modes of tuning is that the oscillator, instead of being a free-running oscillator which is made to track with the tuning of the incoming r-f signal, is a fixed-frequency oscillator whose frequency is controlled by the crystal employed.

4. OPERATING THE RECEIVER.

a. PREPARATION FOR OPERATION.

(1) If not already in place, insert the crystal required for the desired channel of operation in the crystal holder in the left-hand compartment of the front panel. The correct crystal frequency to be used can be determined from this formula:

$$\text{Crystal frequency (in Mc.)} = \frac{\text{selected channel frequency (in mc.)} + 18.6 \text{ mc.}}{12}$$

(2) Position the receiver controls as follows:

CRYSTAL-MANUAL switch S203 (in left compartment)—in CRYSTAL position.

N. L. (noise limiter) switch S202 (in rt. compartment)—in OUT position.

SILENCER switch S501—in OUT position.

A.F. LEVEL control R238 (screwdriver; rt. compartment)—maximum (full clockwise) position.

ALIGN-REC. switch S201 (in left compartment)—in REC. position.

PHONES control R502—in position "8".

(3) Throw POWER switch S502 to its ON position. After about four seconds the neon panel lamp marked CRYSTAL (I503) should light indicating that the receiver is under crystal control and that plate (B+) power is on. If the panel is not illuminated properly, use DIMMER control R501 to bring lamps I501 and I502 up to the desired brilliance. After about two minutes warm-up time loosen the LOCK knob beside the tuning control and proceed to tune for the selected channel frequency.

b. CRYSTAL CONTROLLED TUNING.

Rotate the tuning control crank until the selected channel frequency appears on the calibrated dial visible through the window above, marked MEGACYCLES. This frequency will be equal to 12 times the crystal output frequency, less 18.6 megacycles. The dial reading will indicate approximate tuning. With no signal coming into the receiver the exact setting is obtained by tuning for a maximum reading (maximum "noise") on OUTPUT meter M502. Under this no-signal condition the INPUT meter M501 should read zero, and the level indicated on OUTPUT meter M502 should be between -5db and $+10\text{db}$. If meter M501 does not read zero it should be so adjusted by means of IMP. MTR. potentiometer R214 in the right-hand panel compartment.

Note

Because a harmonic mode crystal is used to control the oscillator circuit, it is possible that, at the frequencies mentioned below, resonance peaks will be observed at two different points in the frequency range when

the receiver is being tuned for a maximum indication on the output meter (M502).

When tuning to a channel within the frequency range of 225-233 megacycles, the second response would occur at the high frequency end of the band, between 387 and 400 megacycles. Conversely, when tuning to a channel within the frequency range of 387-400 megacycles, the second response would occur at the low frequency end of the band, between 225 and 233 megacycles.

To prevent incorrect tuning of the receiver in the 225-233 and 387-400 megacycle ranges the calibrated dial should be set, visually, at the approximate frequency of the desired channel, then the final adjustment made by peaking the output meter for maximum noise indication.

c. SILENCER OPERATION.

If desired, the silencer (squellch) circuit may be put into operation by throwing the SILENCER switch (S501) to its IN position and then adjusting the SILENCER control knob (R233) in the right-hand panel compartment for the desired silencing level.

Note

In setting the silencer control extreme care should be exercised at all times in order that weak signals will not be lost.

This level should ordinarily be the point where "noise" just becomes inaudible under the conditions of no signal input, with the A.F. LEVEL control (R238) set for maximum and the PHONES control

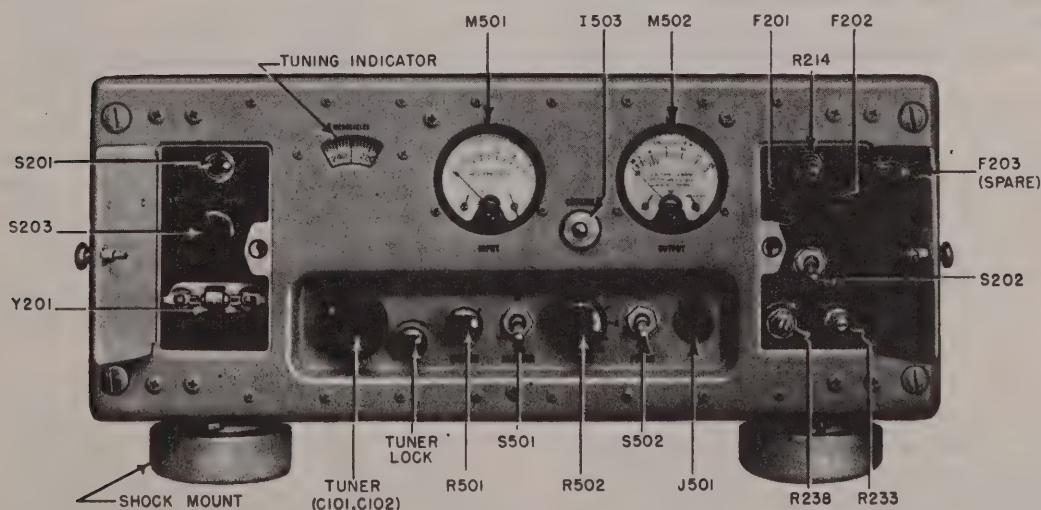


Figure 4-1. Front Panel, Doors Open

(R502) in position #8. Further silencing entails the danger of squelching weak signals which it might be desirable to hear. On the other hand restraint in the use of silencing to less than complete silencing of noise, in the hope of picking up very weak signals, is useless because signals which do not exceed the noise level will be unintelligible in any case. Silencing beyond the minimum necessary for noise suppression would be permissible in the situation where a known signal is anticipated, and where that signal is known to be strong enough to override the "squelching" effect of the silencer circuit.

d. NOISE LIMITER CIRCUIT.

If the noise level is excessive when a signal is being received, the N.L. switch (S202) in the right-hand panel compartment may be thrown to its IN position. This circuit acts as a noise-peak limiter and is effective in the reduction of interference or noise peaks of high intensity and short duration. For this reason it may not always be effective in limiting commutator hum and similar continuous noises, where no large abrupt peaks are present. Because the noise limiter circuit may cause slight distortion of deeply modulated signals, it should be switched off where receiving conditions permit. Use of the noise limiter circuit will cause a drop of about three db in the reading on OUTPUT meter M502.

e. MANUALLY CONTROLLED TUNING.

To operate the equipment as a continuously-variable manually-tuned receiver throw the CRYSTAL-MANUAL switch (S203) in the left-hand panel compartment to its MANUAL position. This will cause the neon panel lamp marked CRYSTAL (I503) to go out.

The receiver may now be tuned to any channel frequency within the 225-400 megacycle range by operation of the single tuning control crank on the front panel. The sensitivity of the receiver is approxi-

mately the same for either crystal controlled or manual tuning, and will be greater than eight microvolts for a 10 db signal-to-noise ratio over the entire range.

f. INPUT METER M501

INPUT meter M501 is used to give an approximate indication of the level, in microvolts, of the incoming signal. However, the relation between the level of the incoming signal and the position of the meter pointer is non-linear. Furthermore, this relation will vary with the frequency (channel) at which the receiver is operated, and also, slightly, between any two R-266/URR-13 receivers operating at the same frequency. It is therefore desirable that a calibration chart be prepared correlating measured values of signal level with corresponding meter readings. A typical chart is shown in table 4-1.

To prepare such a chart for an individual receiver, disconnect the antenna input cable from receptacle J404 and substitute the output of an r-f signal generator. With known values of input it is only necessary to observe the corresponding readings on the meter to complete the chart.

TABLE 4-1. TYPICAL INPUT METER CALIBRATION

Input (Microvolts)	Input Meter Reading
10	.10
30	.20
100	.28
1000	.43
10000	.52
30000	.57
50000	.60

SECTION 5 OPERATOR'S MAINTENANCE

1. GENERAL.

Although maintenance of a radio equipment is primarily the responsibility of technical personnel, it is nevertheless essential that the operator keep watch over his equipment during use in order that minor defects may be discovered, and either corrected or reported before major trouble develops.

It is suggested that the routine operational check

outlined below be made at the beginning of each watch, or when operation is resumed after more than 6-8 hours of idleness.

2. ROUTINE OPERATIONAL CHECK CHARTS.

The checks tabulated in table 5-1 should be made hourly during operation, and at the beginning of each watch.

TABLE 5-1. ROUTINE OPERATIONAL CHECK CHART

WHAT TO CHECK	HOW TO CHECK	REMARKS
Dial Lamps (I501 and I502)	Check visually to see that lamps are lighted when DIMMER control is rotated to max. clockwise position.	Failure of one lamp is fault in lamp. Failure of both probably indicates power failure. Check fuses, and A.C. PWR. input connection (J401/P401).
Neon Glow Lamp marked CRYSTAL (I503)	Check visually to see that lamp glows when CRYSTAL-MANUAL switch is in CRYSTAL position.	Indicates loss of plate voltage. Failure of lamp itself very unlikely.
Receiver Operation	Turn A. F. LEVEL control to max. clockwise position and throw SILENCER switch to OUT position. OUTPUT meter should indicate noise output.	A reading of between -5 db and +10 db on OUTPUT meter indicates normal operation of receiver.
External Cables and Connectors	Check connectors at rear of receiver for looseness or intermittent connection.	Loose connections may cause intermittent operation.

3. EMERGENCY MAINTENANCE.

a. GENERAL.

In addition to making the routine checks outlined above, the operator should be sufficiently familiar with his equipment to be able, in an emergency, to rectify minor damage or disarrangements which might develop during battle or other periods of emergency when technical aid is not immediately available. Since under such conditions, tube and fuse failures will be most likely and most frequent causes of trouble, the information in the following paragraphs is provided to enable operating personnel to recognize those symptoms which indicate trouble in these components.

Notice To Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

b. FUSE INFORMATION.

The two two-ampere, type 3AG-2, glass tube fuses located in the right-hand panel compartment (F201 and F202) are the only fuses used in Radio Receiver R-266/URR-13. These protect the 115-volt,

60 cps primary circuit. If one of these blows it should be replaced with one of exactly the same rating, and then only after the circuit has been checked to make certain that no obvious fault exists. The standard Navy stock number for these fuses is given in table 8-4.

A spare fuse (F203) is mounted in clips on the inside of the panel compartment door. Additional spare fuses should be kept at hand for replacement use. If fuse F201 and/or fuse F202 blows following a replacement, it is possible that the rectifier tube (V301) is faulty, and the operator may try replacement of this tube. (See paragraph 3c below.) However, if this fails to correct the trouble, further servicing must be entrusted to qualified maintenance personnel.

CAUTION

Never replace a fuse with one of higher rating unless continued operation of the receiver is more important than the probable damage to it. If a fuse burns out immediately after replacement, do not make a second replacement until the cause of the trouble has been corrected.

c. ELECTRON TUBE INFORMATION.

The full complement of electron tubes used in Radio Receiver R-266/URR-13 is given in table 1-4. These tubes are all located in either the preselector unit, or in the IF/AF section or the power supply section of the receiver chassis. Their relative locations within these areas of the receiver are shown in the tube socket diagrams of figures 7-12, 7-14 and 7-13 respectively, and in the photographs of figures 1-4, 16- and 2-15, respectively.

Access to tubes in the IF/AF section (figures 1-4 and 7-14) is gained by releasing the four fasteners in the corners of the front panel and withdrawing the chassis as far as the mechanical stops will permit. Access to tubes in the power supply section (figures 1-6 and 7-13) is gained by releasing these stops in the manner shown in figure 5-1 and removing the chassis from the cabinet. To gain access to the tubes in the preselector, the shielding covers at the left side of the chassis (figures 7-9 and 2-3) must be removed. This is best done with the chassis stood on its right side.

If the receiver fails to operate, but the dial lamps remain lighted indicating the presence of primary power, the cause may be attributable to tube failure. Since it will not be known which tube has failed, each tube in the receiver should be replaced with a tube known to be good (and of the same type) in the following order, until the defective one is located: first, those in the power supply section; next those in the IF/AF section, and finally, those in the preselector unit.

Notice

In the equipment as shipped from the factory the oscillator-1st doubler tube (V106A, V106B) is of "ruggedized" construction; the remainder are not. However, when making replacements "ruggedized" types should be used wherever possible.

d. RE-ADJUSTMENT OF SILENCER CIRCUIT POTENTIOMETER R254.

If it should become necessary to replace the silencer amplifier tube (V208) it will be necessary to check, and if necessary re-adjust, the setting of potentiometer R254. Tube V208 and potentiometer R254 are both shown in figure 1-4. To make the adjustment: (after tube replacement is completed).

(a) With no incoming signal, tune the receiver to the frequency determined by the crystal (R238) in the crystal holder.

(b) Set the A.F. LEVEL control (R238) in the right-hand compartment in its maximum (extreme clockwise) position.

(c) Turn the SILENCER control (R233) to its extreme left (counter-clockwise) position; then re-rotate it clockwise until the screwdriver slot is horizontal.

(d) Now set potentiometer R254 at the point where it causes the noise level reading on OUTPUT meter M502 to drop about two db below the maximum.

(e) With R254 so adjusted, rotation of the SILENCER control to the left will eliminate all silencing (squelch) effect, while rotating it to the right should increase it to any level required.

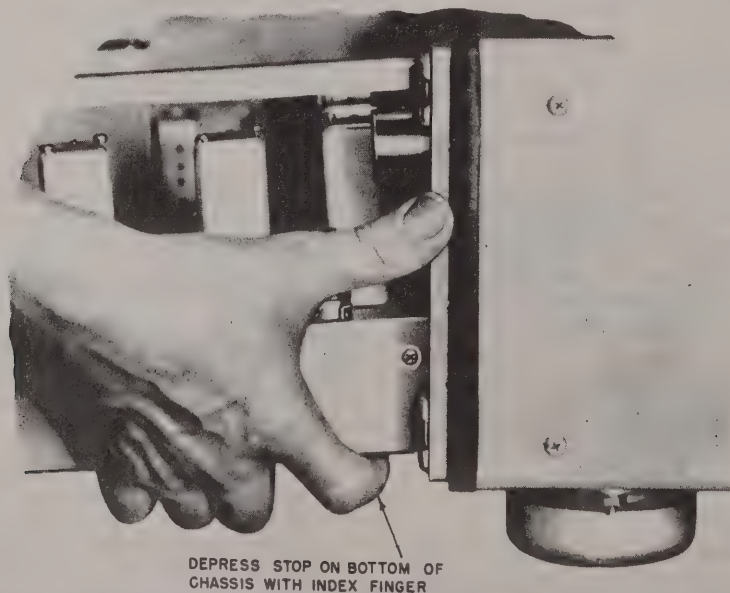


Figure 5-1. Right Side Detail Showing Method of Removal of Chassis from Cabinet

SECTION 6

PREVENTIVE MAINTENANCE

1. GENERAL.

While the AN/URR-13 equipment has been designed and built to give as continuous and trouble-free operation as possible, a certain amount of wear and deterioration must be expected in any apparatus of this nature. If detected and corrected at an early stage, trouble from these causes can be minimized, but if nothing is done until trouble actually occurs, a serious shut down may be necessary at a time when use of the equipment is most needed.

Since wear and deterioration, though they represent potential trouble, are not always evident in themselves, it is essential to continued trouble-free operation that certain vital points be inspected periodically, and that necessary replacements and adjustments be made when discovered. Such systematic inspection and adjustment will insure consistent operation, and will increase the efficiency and life of the equipment.

A practical working schedule is outlined below. However, it may be found desirable to modify this schedule as experience dictates, since the exact intervals at which certain maintenance procedures must be performed will be determined by such factors as the operating schedule of the station or ship and prevailing atmospheric conditions.

2. OVERALL INSPECTION.

An overall inspection of the equipment is recommended as a precautionary measure immediately before being put into service, and thereafter at intervals of three or four months, the exact intervals depending upon service conditions and upon whether or not any faults have developed.

Such an inspection involves a complete examination of electrical wiring and mechanical details, and of general electrical and mechanical operation. Also any cleaning necessary to remove accumulated dirt.

Suggested routines for periodic electrical and mechanical inspection are given in the routing maintenance check charts shown below.

3. ROUTINE MAINTENANCE CHECK CHARTS.

SAFETY NOTICES

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE "BUREAU OF SHIPS MANUAL", OF THE LATEST ISSUE. PERSONNEL ARE ALSO REQUESTED TO READ THE SAFETY INSTRUCTIONS INCLUDED IN THE FRONT MATTER FOR THIS BOOK.

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PROCEDURE
HOURLY, Or Every Watch		
See "Routine Check Chart," Table 5-1		
DAILY and WEEKLY		
None Required		
MONTHLY		
Receiver sensitivity and reserve gain	Check as outlined in section 7, Corrective Maintenance	If sensitivity or reserve gain is low receiver will require tube replacement or alignment as outlined in section 7.
Cables and connectors	Detach cables and examine insulation for possible damage. Examine cable connectors for loose, bent or dirty contacts; also for damaged threads and loose cable clamp screws.	If dirt or grease is present on contacts, clean with carbon tetrachloride.

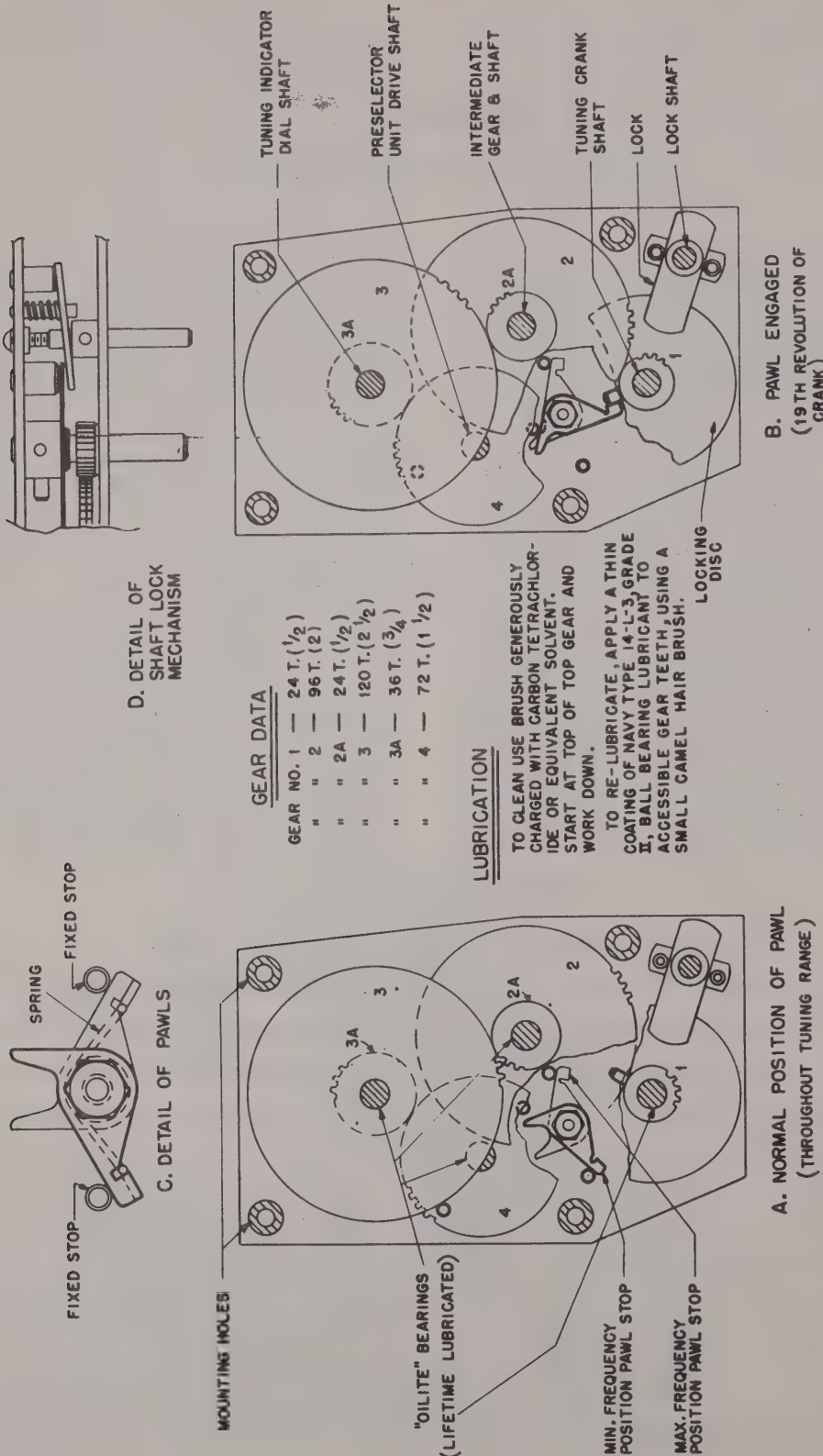


Figure 6-1. Details of Dial Drive Mechanism for Presetor Unit, Showing Automatic Stop Device

TABLE 6-1. (Continued)

WHAT TO CHECK	HOW TO CHECK	PROCEDURE
Front panel and sub-panel controls, switches, knobs, etc.	Check for looseness of switch and control mounting nuts. Check for missing or loose knobs	Tighten loose nuts, replace missing knobs and tighten loose knobs. A Bristol set-screw key for tightening knob set-screws is mounted at the rear of sub-panel
Blower operation	Check blower operation by closing contacts of thermostatic switch S301 (on rear of chassis behind preselector). This can be done mechanically by probing the switch with an insulated rod when the receiver is connected up for bench testing	If closing of contacts fails to start blower check connections to blower and blower capacitor. If necessary to replace blower, follow removal instructions given in paragraph 5a of section 7
QUARTERLY		
Air filters	Remove filter units from inside of cabinet by sliding the type snap-slide fasteners and inspect	If units are clogged with dust, clean with gasoline and recharge with SAE #20 oil
Electron tubes	Check all electron tubes in a mutual-transconductance type tube tester. Replace any tube having a transconductance value of less than 75 percent of normal	When making tube replacements, the "ruggedized" models of all types should be used whenever possible
ANNUALLY		
Receiver chassis and cabinet	Inspect receiver chassis, top and bottom for loose parts, assemblies and chassis assembly screws. Inspect for dirt on tube sockets and in the preselector housing. Inspect cabinet for loose mounting screws on track slides and shock mounts. Check for damage to parts due to overheating, etc.	A small paint brush may be used to remove dirt from tube sockets, etc. It will be necessary to use a compressed air hose to remove dirt from preselector housing and capacitor plates
Dial drive mechanism	Observe smoothness of dial operation, and inspect the gears in the drive mechanism visually for evidence of grit and dirt in the teeth	If operation of the dial drive indicates that the gears are sticky or binding, clean the mechanism with carbon tetrachloride and relubricate with Navy-type 14-L-3, grade II, medium, ball bearing lubricant, as explained in figure 6-1

4. LUBRICATION.

No part of Radio Receiving Set AN/URR-13 will require lubrication at any time as a preventive measure against damage to the equipment. However, a little Navy type 16-L-2, grade II, medium, ball bearing lubricant applied to the tops of the guide rails on either side of the cabinet (figure 3-3) every three or four months, will facilitate removal of the chassis from the cabinet, and its reinsertion. This same grease can be applied sparingly to the alignment pins at the rear of the cabinet and to the four Simmons fasteners which secure the chassis in the cabinet.

Also, if operation of the dial drive mechanism becomes sluggish due to accumulated dust and grit in the gears, it may be advisable to clean and relubricate the gears as explained in figure 6-1. To clean the gears use a small bush generously charged with carbon tetrachloride, and start with the top gear and work

down. To relubricate apply a coating of the above mentioned lubricant to the teeth of the accessible gears, using a small camel hair brush.

5. RE-TROPICALIZATION.

In manufacture, the AN/URR-13 equipments are not tropicalized as complete assemblies, but instead, use is made of materials and parts which are either inherently moisture and fungus resistant, or which have been tropicalized individually prior to assembly in the receiver. Since the repair parts provided are identical with the parts used in the equipment, pre-tropicalized parts will be replaced with pre-tropicalized parts and the overall resistance of the equipment to moisture and fungus should be unaffected. The terminal boards in the AN/URR-13 equipment are made of glass-bonded melanine.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause

of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest district publications and printing office.

FAILURE REPORT—ELECTRONIC EQUIPMENT
NAVSHIPS (NBS) 383 (REV. 8-53)
(FORMERLY NAVSHIPS (NBS) 383 AND NAVSHIPS (NBS) 383)

SHIP NUMBER AND NAME OR STATION _____

CHECK ONE: ☐ RADIO

EQUIPMENT MODEL DESIGNATION _____

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED _____

TUBE TYPE, INCLUDING PREFIX LETTERS _____

TUBE MANUFACTURER _____

FAILURE OCCURRED IN:
☐ STORAGE ☐ OPERATION
☐ HANDLING ☐ OTHER (SPECIFY) _____
NATURE OF FAILURE AND REPAIR _____

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)
NAVSHIPS (NBS) 383 (REV. 11-48)

ORGANIZATION PERFORMING MAINTENANCE _____

EQUIPMENT INVOLVED
☐ Navy ☐ Army ☐ USMC ☐ JAG ☐ Command ☐ Other (Specify) _____

☐ Radio ☐ Radar ☐ Sonar ☐ Wire ☐ Test ☐ Power ☐ Sound ☐ Other (Specify) _____

EQUIPMENT MODEL DESIGNATION _____ SERIAL NUMBER OF EQUIPMENT _____ NAME OF CONTRACTOR _____ CONTRACT NO. _____

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED _____ SERIAL NUMBER OF UNIT _____ CONTRACT OR PO DATA OF UNIT _____ DATE EQUIPMENT RECEIVED _____

ITEM WHICH FAILED

THIS SIDE FOR TUBES

TUBE TYPE, INCLUDING PREFIX LETTERS _____ SERIAL NO. (NOTE 8) _____

TUBE MANUFACTURER _____ CONTRACT NO. (NOTE 9) _____

FAILURE OCCURRED IN:
☐ Storage ☐ Operation ☐ Handling ☐ Other (Specify in Remarks) _____

GUARANTEED HOURS (NOTE 8) _____ DATE OF ACCEPTANCE (NOTE 8) _____

ACTUAL HOURS _____ DATE OF FAILURE _____

TYPE OF FAILURE (NOTE 7) _____ TUBE CIRCUIT SYMBOL (NOTE 7) _____

NATURE OF FAILURE AND REMARKS (NOTE 8) (CONTINUE ON BACK) _____

THIS SIDE FOR PARTS (NOTE 9)

NAME OF PART _____ CIRCUIT SYMBOL (88 R-134) _____ NAVY TYPE NO. _____

SERIAL NO. _____ CONTRACT DATA _____ DATE RECD. _____ ARMY STOCK NO. _____

*CHECK-OFF OR TAG DATA (NOTE 9) _____ *MANUFACTURER'S DATA (NOTE 9) _____

BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK) _____

CONCLUSION:
☐ Replaced ☐ Repaired ☐ Rebuilt ☐ Reworked ☐ Transmitted ☐ Other (Specify) _____

*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

16-55581-1 U. S. GOVERNMENT PRINTING OFFICE

Figure 7-1. Failure Reports Form, NBS-383

SECTION 7 CORRECTIVE MAINTENANCE

1. INTRODUCTION.

Corrective maintenance covers that phase of the care of the equipment which deals with the location and correction of trouble which has already occurred, and which it is beyond the province of the operator to attempt to correct. For this work it is assumed that technical personnel with radio training are available.

SAFETY NOTICES

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE "BUREAU OF SHIPS MANUAL", OF THE LATEST ISSUE. PERSONNEL ARE ALSO REQUESTED TO READ THE SAFETY INSTRUCTIONS INCLUDED IN THE FRONT MATTER FOR THIS BOOK.

2. TROUBLE SHOOTING.

a. GENERAL.

When properly installed any irregularities which occur in the performance of the equipment will be attributable either to misadjustment of one or more of the controls, or to the failure of some part.

In most cases it will be possible to localize a particular fault from the general nature of the trouble encountered. Faulty or abnormal action of a particular control will often indicate the particular section of the receiver, and the specific portion of the circuit in which the trouble lies. Reference to the schematic diagram of figure 7-17, and to the functional diagrams of figures 2-2, 2-5, 2-7 through 2-13, 2-14 and 2-16 will aid in localizing particular faults.

b. TROUBLE SHOOTING CHARTS.

In tracing faults an orderly and systematic procedure should be followed. The trouble shooting chart shown in table 7-4 gives the symptoms of troubles commonly encountered in the left-hand column, the possible causes of these symptoms in the middle column and suggested corrective measures in the right-hand column.

c. VOLTAGE AND RESISTANCE MEASUREMENTS.

The values of voltage and resistance from each

tube socket terminal to ground, and/or other significant points, are summarized in table 7-5.

Similar values measured from terminal board terminals to ground, and/or other significant points, are given in table 7-6.

Because it is not feasible to take voltage and resistance readings in the preselector while the receiver is operative, alternate significant voltage measurements are shown in figure 7-15.

The conditions under which the above measurements were made were: line voltage, 115 volts, 60 cps; receiver tuned to 300 megacycles; ALIGN-REC switch in REC position; SILENCER switch in OUT position, and N.L. switch in OUT position. The measurements were made with a multimeter ME-5/U series, or a Navy model OBQ series, or equivalent, electronic voltmeter. Resistance measurements were made with the power connector disconnected.

Values of voltage and resistance as measured in the equipment should be within $\pm 20\%$ of those given in the tables.

3. ELECTRON TUBE INFORMATION.

a. TUBE DATA.

The full complement of electron tubes used in Radio Receiver R-266/URR-13 is given in table 1-4. These tubes are all located in either the preselector section, in the IF/AF section or the power supply section of the receiver chassis. Their relative locations within these areas of the receiver are shown in the tube socket diagrams of figures 7-12, 7-14 and 7-13, respectively, and in the photographs of figures 1-4, 1-6 and 2-3, respectively.

Voltage and resistance measurements between each pin of each tube and ground, or other significant point, are given in table 7-5.

The rated operating characteristics of each type of tube employed are listed in table 7-7. Physical dimensions and characteristic curves are not given because this information is readily available, if ever needed, in standard commercial catalogs.

b. TUBE CHECKING.

Access to tubes in the IF/AF section (figures 1-4 and 7-14) is gained by releasing the four fasteners in the corners of the front panel and withdrawing the chassis as far as the mechanical stops will permit.

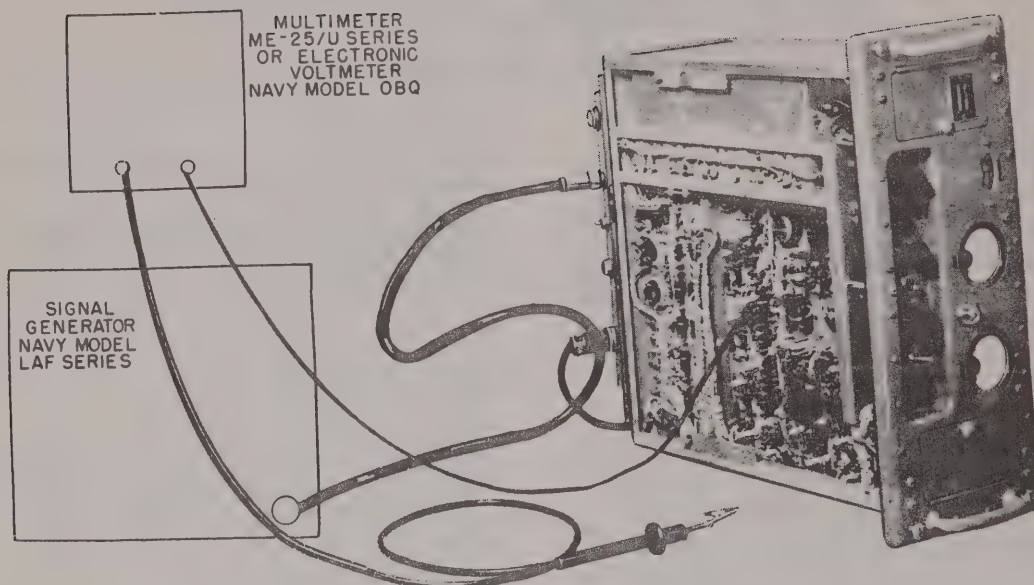


Figure 7-2. Bench Set-up for Alignment of R-f Section of Receiver

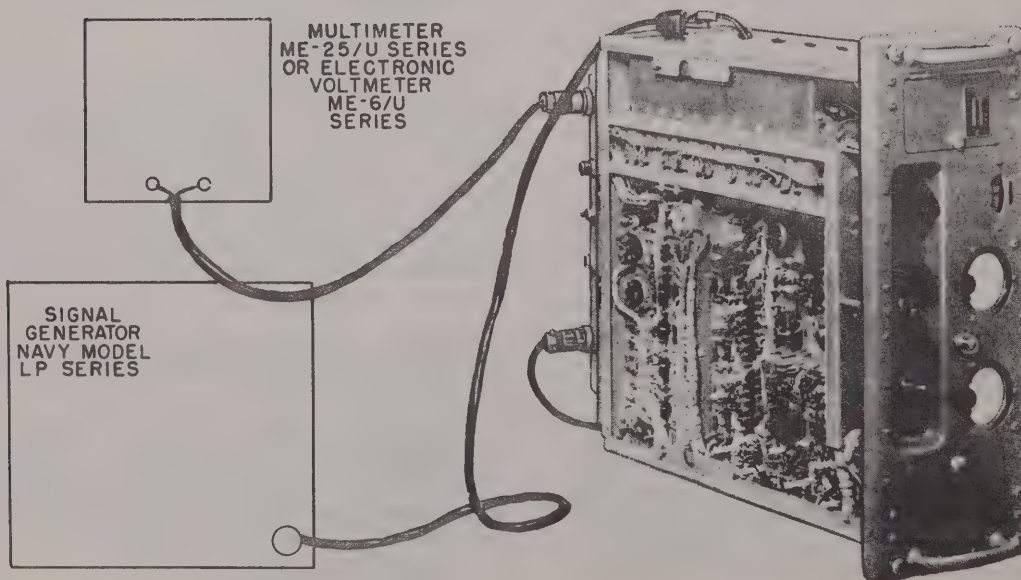


Figure 7-3. Bench Set-up for Alignment of I-f Section of Receiver

Access to tubes in the power supply section (figures 1-6 and 7-13) is gained by releasing these stops in the manner shown in figure 5-1 and removing the chassis from the cabinet. To gain access to the tubes in the preselector, the shielding covers at the left side of the chassis (figures 7-9 and 2-3) must be removed. This is most conveniently done with the chassis standing on its right side.

TUBE REPLACEMENT NOTICE

All tubes of a given type supplied with the equipment shall be consumed prior to employment of tubes from general stock.

If the receiver fails to operate, but the dial lamps remain lighted indicating the presence of primary power, the cause is probably attributable to tube failure. Since it will not be known which tube has failed, each tube in the receiver should be replaced with a tube known to be good (and of the same type) in the following order, until the defective one is located: first those in the power supply section; next those in the IF/AF section, and finally, those in the preselector.

Notice

In the equipment as shipped from the factory the oscillator-1st doubler tube (V106A, V106B) is of "ruggedized" construction; the remainder are not. However, when making replacements "ruggedized" types should be used wherever possible.

4. ALIGNMENT PROCEDURES.

a. EQUIPMENT REQUIRED.

The following equipment should be available for proper alignment of the r-f and i-f sections of Radio Receiver R-266/URR-13:

(1) A Navy Model LP series, or equivalent, signal generator.

(2) A Navy Model LAF series signal generator with 6 db pad, or equivalent.

(3) A multimeter ME-25/U series, or a Navy Model OBQ series or equivalent electronic voltmeter.

b. PREPARATION OF THE RECEIVER FOR ALIGNMENT.

(1) Remove the receiver chassis from the cabinet and place on bench with right side down.

(2) Remove cable filter (Band Suppression Filter F-89/URR-13) from rear of cabinet by disengaging snap-slide fasteners (figure 3-3); the filter must be removed through front of cabinet.

(3) Plug cable filter into rear of receiver chassis being careful not to damage the connectors.

(4) Connect power cord.

(5) Turn SILENCER and N.L. switches to their OFF positions.

WARNING

When the receiver is set up for bench testing, as above and the POWER switch is OFF, dangerous voltages are still present at the following points:

(a) Power-audio connector P301 at the rear of the receiver chassis;

(b) Power fuses F201 and F202 at the right side of the front sub-panel;

(c) Terminals No. 9 and No. 10 on the power supply terminal board E303 (figure 1-5).

c. ALIGNMENT OF THE I-F SECTION OF THE RECEIVER (See figure 7-3).

(1) Connect the output of a Navy model LP series, or equivalent, signal generator to the mixer grid inductance trimmer screw (figure 7-4) through a 0.01 μ f mica capacitor.

(2) Turn the receiver tuning dial to 218 megacycles, throw the CRYSTAL-MANUAL switch to CRYSTAL, remove the crystal from the crystal holder and throw the ALIGN-REC. switch to REC.

(3) Throw the receiver POWER switch to ON and allow the receiver to warm up for about five minutes.

(4) Tune the signal generator to 18,615 Kc, ± 1 Kc, and modulate 50% with 1000cps.

(5) Turn the A.F. LEVEL control clockwise to its maximum position.

(6) Adjust the output of the signal generator until the OUTPUT meter (M502) reads above the noise level, but below 10 db.

Note

An electronic voltmeter ME-6/U series, or a multimeter ME-25/U series, may be used to monitor audio output voltage instead of the output meter. In this case connect the electronic voltmeter to the AUDIO output connector (J402) on the cable filter unit or, by means of a suitable phone plug, to the phones jack on the front panel of the receiver. Adjust the signal generator output so that the meter reads below six volts.

(7) Tune for maximum reading on the OUTPUT meter by adjusting the tuning screws of the i-f transformers (top and bottom) with the alignment tool provided (see figure 1-4), in the following order: T206, T205, T204, T202, and the bottom screw of T201.

Note

While aligning the i-f transformers, reduce the output of the signal generator as necessary to keep the OUTPUT meter reading below 10 db. This prevents overloading of the a-f stages which would obscure the true tuning peak, and also maintains the signal level below or near the threshold of

AVC. Excessive AVC operation would result in mis-tuning of the i-f circuits.

(8) Tune the mixer plate tuning inductance screw (L122, figure 7-4) for a maximum reading on the OUTPUT meter.

The i-f transformers are now aligned. The OUTPUT meter should read 10 db with the signal generator adjusted for about 15 microvolts.

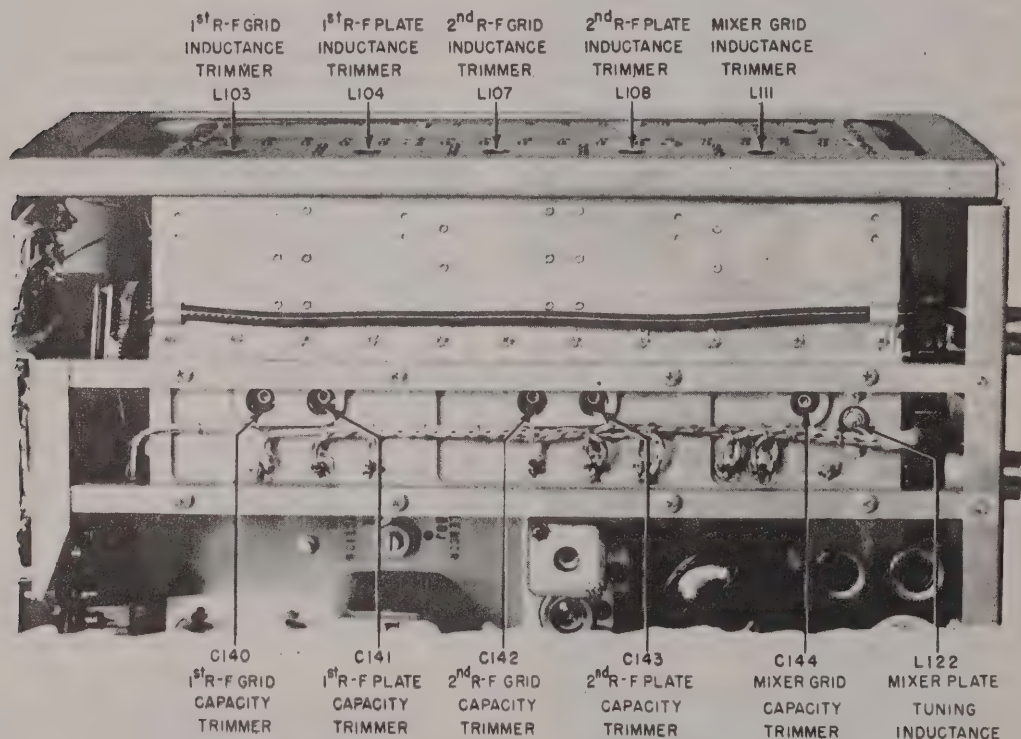


Figure 7-4. Preselector from Top of Chassis Showing Alignment Adjusting Screws

d. ALIGNMENT OF THE R-F SECTION OF THE RECEIVER (PRESELECTOR). (See figure 7-2).

The bench set-up for alignment of the preselector unit is shown in figure 7-2. Before beginning alignment remove the preselector shielding covers and loosen the inductance trimmer locking screws (figure 7-7) slightly (about $\frac{1}{8}$ th turn) by means of the Bristol type wrench mounted on the sub-panel near the dial drive assembly. Then replace the preselector shielding covers.

(1) Connect the output of the Navy model LAF signal generator through a 6 db pad to the ANT. connector (J404) on the cable filter. Turn the output attenuator on the signal generator to its maximum counter-clockwise position.

(2) Install the crystal corresponding to some receiver frequency between 230 and 234 megacycles; turn the CRYSTAL-MANUAL switch to CRYSTAL; set the tuning dial to the crystal channel selected, and lock the tuning dial.

Crystal frequency=
$$\frac{\text{Channel frequency plus 18.6 megacycles}}{12}$$

(3) Refer to figures 7-4, 7-8 and 7-9 for location of preselector tuning adjustments and test points. Place the probe of the electronic multimeter on the 1st doubler grid test point (C122) and tune the oscillator inductance tuning screws (L114) for a maximum meter reading. Connect the return to the chassis of the receiver.

TABLE 7-1. TYPICAL VOLTAGE READINGS
(D. C.) AT ALIGNMENT TEST POINTS

Conditions	Test Points (See figures 7-8, 7-9 and 7-15)			
	C122	C124	C131	L111
L.F. Alignment Check	—2.5	—12.5	—12.5	—1.6
H.F. Alignment Check	—3.2	—13.0	—15.0	—5.0

(4) Place the probe of the electronic multimeter on the 2nd doubler grid test point. (C124) and tune the 2nd doubler grid inductance tuning screws (L115) for a maximum meter reading.

(5) Place the probe of the electronic multimeter on the tripler grid test point (C131) and tune the tripler grid inductance tuning screw (L117) for a maximum meter reading.

(6) Place the probe of the electronic multimeter on the mixer grid inductance trimmer screw (L111) and tune the tripler plate inductance trimmer screw (L112) for a maximum meter reading.

Note

The oscillator, 2nd doubler and tripler grid tuning adjustments may be aligned by turning the ALIGN-REC. switch to the ALIGN position and tuning for a maximum reading on the INPUT meter (M501). However, the foregoing is the preferred procedure.

(7) Connect the probe of the electronic multimeter to the junction of resistors R224 and R225 on the underside of the IF/AF section. This point is the 2nd detector diode voltage test point.

Note

The following adjustments may also be made by using the INPUT meter (M501) with the ALIGN-REC. switch in the REC. position, instead of an electronic multimeter, for tuning indication. If the INPUT meter is used, substitute "INPUT meter" for "multimeter" in steps Nos. 8, 9, 10, 17, 18, and 19. Also substitute "0.07" for "0.6 volts" in No. 8 and No. 9, and "0" for "0.3 volts" in step No. 10.

(8) With modulation OFF tune the Navy model LAF series signal generator for a maximum reading on the electronic multimeter. The output attenuator should be adjusted to give a reading of approximately 0.6 volts on the VTVM.

(9) Using the alignment tool, tune the r-f amplifier and mixer inductance trimmer screws (figure 7-7) for a maximum readings on the VTVM, in the following order:

- (a) Mixer grid inductance trimmer (L111).
- (b) 2nd r-f plate inductance trimmer (L108).
- (c) 2nd r-f grid inductance trimmer (L107).
- (d) 1st r-f plate inductance trimmer (L104).
- (e) 1st r-f grid inductance trimmer (L103).

While tuning, reduce the output of the signal generator as necessary to keep the multimeter reading at approximately 0.6 volts.

(10) Throw the CRYSTAL-MANUAL switch to MANUAL. Notice that when this is done, the multimeter reading may drop to about 0.3 volts. Now tune the oscillator inductance tuning screw (L114) until the multimeter reading is maximum.

(11) Throw the CRYSTAL-MANUAL switch to CRYSTAL, install the crystal corresponding to some channel frequency between 391 and 395 mc, set the tuning dial to the crystal channel selected, and lock the tuning dial.

(12) Place the probe of the electronic multimeter on the 1st doubler grid test point (C122) and tune the oscillator capacity trimmer screw (C148) for a maximum meter reading.

Note

In tuning the capacity trimmers, a slight capacity is added to the circuit by the presence of the alignment tool. It is therefore necessary to compensate for this capacity by tuning the trimmers slightly beyond maximum, in a clockwise direction, so that the electronic multimeter will read a maximum when the alignment tool is removed from the trimmer screw. This capacity effect of the alignment tool will make the adjustment of the oscillator capacity trimmer screw more critical in step No. 19.

(13) Place the probe of the multimeter on the 2nd doubler grid test point (C124) and tune the 2nd doubler grid capacity trimmer screw (C147) for a maximum meter reading.

(14) Place the probe of the multimeter on the tripler grid test point (C131) and tune the tripler grid capacity trimmer screw (C145) for a maximum meter reading.

(15) Place the probe of the multimeter on the mixer grid inductance trimmer screw (L111) and

tune the tripler plate capacity trimmer screw (C146) for a maximum meter reading.

(16) Connect the probe of the multimeter to the junctions of resistors R224 and R225 on the underside of the IF/AF section.

(17) Tune the signal generator for a maximum reading on the multimeter. The output attenuator of the signal generator should be adjusted to give a reading of approximately 0.6 volts on the multimeter.

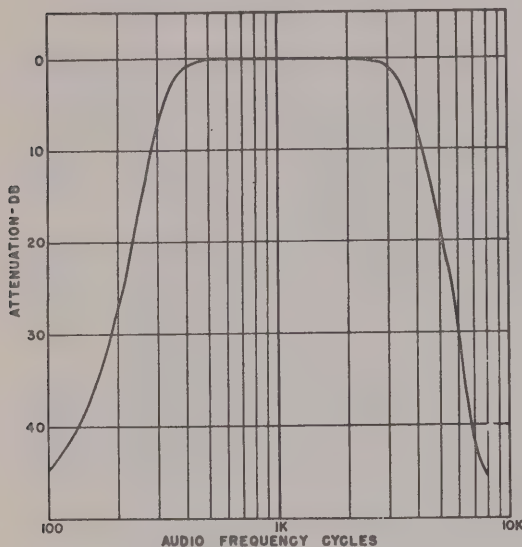


Figure 7-5. Overall Audio Response Characteristic

(18) Using the alignment tool, tune the r-f amplifier and mixer capacity trimmer screws for a maximum reading on the multimeter, in the following order:

- (a) Mixer grid capacity trimmer (C144).
- (b) 2nd r-f plate capacity trimmer (C143).
- (c) 2nd r-f grid capacity trimmer (C142).
- (d) 1st r-f plate capacity trimmer (C141).
- (e) 1st r-f grid capacity trimmer (C140).

(19) Throw the CRYSTAL-MANUAL switch to MANUAL. Note that when this is done the electronic multimeter reading may drop to about 0.3 volts. Now tune the oscillator capacity trimmer screw until the multimeter reading is maximum (See note under step No. 12 above).

(20) Repeat steps Nos. 1 through 19 until no further adjustment of the capacity trimmers is necessary to align the high frequency alignment point.

Note

Always terminate alignment by aligning the preselector at the high frequency alignment point.

(21) After alignment of the preselector, remove the preselector shielding covers and tighten the inductance trimmer locking screws (figure 7-7) carefully, so that the adjustments will not be disturbed.

(22) Check the alignment of the receiver by making sensitivity and reserve gain measurements.

e. ALIGNMENT OF PRESELECTOR IF ALIGNMENT POINT CRYSTALS ARE NOT AVAILABLE.

The following procedure must be used if crystals which will tune the receiver to the required alignment frequencies are not available. This procedure will describe a different method of aligning the oscillator stage only. Alignment of the other stages of the preselector will then be as described above.

(1) Set up, near the receiver, a heterodyne frequency meter such as a Navy model LM or LR series, which will cover the range of 10-18 megacycles, or the range 20-35 megacycles, and couple it, through a d-c blocking capacitor, to capacitor C123 located on the oscillator side of the preselector. Then:

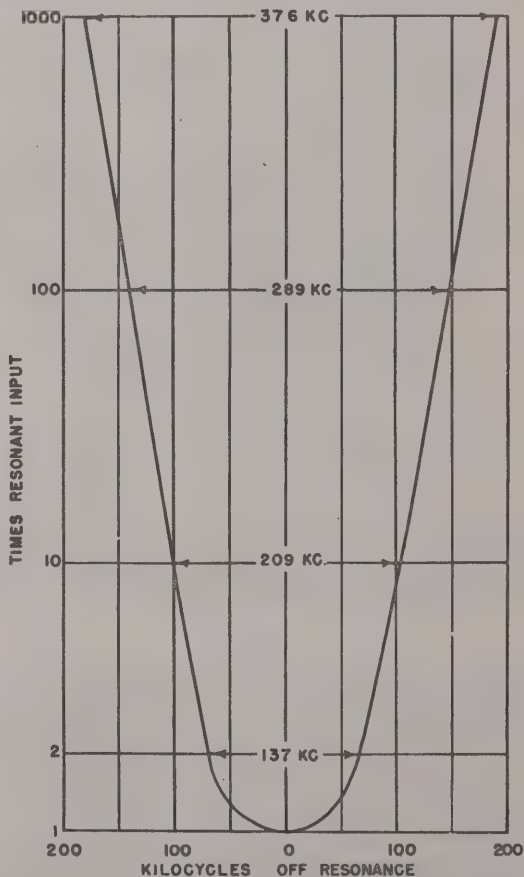


Figure 7-6. Overall I-f Selectivity Characteristic

(a) Set the tuning dial of the receiver at "232", throw the CRYSTAL-MANUAL switch to MANUAL, and install any crystal.

Note

The frequency of the crystal used in this case is immaterial, but a crystal of some frequency must be in the crystal holder during MANUAL operation because of capacity effects.

(b) Tune the frequency meter to 20.883 megacycles, or to half of this frequency.

(c) Tune the oscillator inductance trimmer screw (L114) until it is adjusted for zero beat (as near as possible) on the frequency meter headphones.

(d) Proceed with steps Nos. 4 through 9, inclusive, as given under paragraph 4d above.

(e) Set the tuning dial of the receiver to "393".

(f) Tune the frequency meter to 34.300 megacycles, or to half of this frequency.

(g) Tune the oscillator capacity trimmer screw (L114) until it is adjusted for zero beat (as near as possible) on the frequency meter headphones.

(h) Proceed with steps Nos. 13 through 22, inclusive as given under paragraph 4d above, omitting step No. 19.

5. REMOVAL AND REPLACEMENT OF PARTS.

Removal and replacement of most of the parts of Radio Receiver R-266/URR-13 is a straightforward procedure involving only the removal of mounting bolts and the unsoldering of connecting wires. However, the following five of the parts for which repair parts are provided are so located that special precautions should be taken, and/or preferred procedures followed, when removing them for repair or replacement.

a. BLOWER BL301.

Blower BL301 is in the right rear corner of the chassis as shown in the top view (figure 1-4). Its removal entails removal of the right side plate of the receiver chassis, and should be undertaken as follows:

(1) Take off the right side plate by removing

(a) Four screws entering side panel from front panel.

(b) Three screws entering side panel from rear panel.

(c) Eight screws connecting side panel to chassis, and to front panel sub-assembly.

(2) Disconnect blower bracket from power supply sub-panel by removal of three screws.

(3) Unsolder the incoming lead which goes to C304, at C304.

(4) Unsolder the incoming lead which is common to the two motor windings at the lug on terminal board E302 (figure 1-5) where it is connected.

(5) Remove the sub-assembly comprising blower, bracket and capacitor C304.

(6) If a new blower is to be installed in place of the one in the equipment, transfer the bracket and the capacitor to the new part and reverse the above procedure.

b. BLOWER CAPACITOR C304.

The blower capacitor is located underneath blower BL301 in the right rear corner of the chassis (see figure 1-4), and is attached to the same bracket which supports the blower. If there is any reason to remove the blower at the same time, the capacitor can be

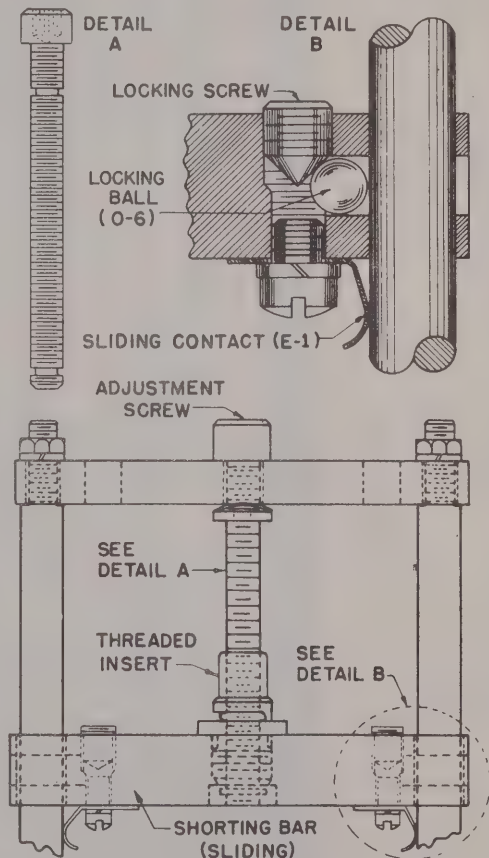


Figure 7-7. Details of Trimmer Inductances L103, L104, L107, L108, L111, and L112 (Preselector)

removed by removing the blower and bracket as explained in paragraph 5a above, in which case it will be necessary merely to unbolt the old capacitor from the blower bracket and attach the new one. However, if there is no reason to remove the blower, access to the capacitor is more easily gained by first removing filter choke L301, located between the blower and the large type 5U4G rectifier tube V301, as follows:

(1) Unsolder the wires from the three terminals of choke L301 (underside of chassis—figure 2-15).

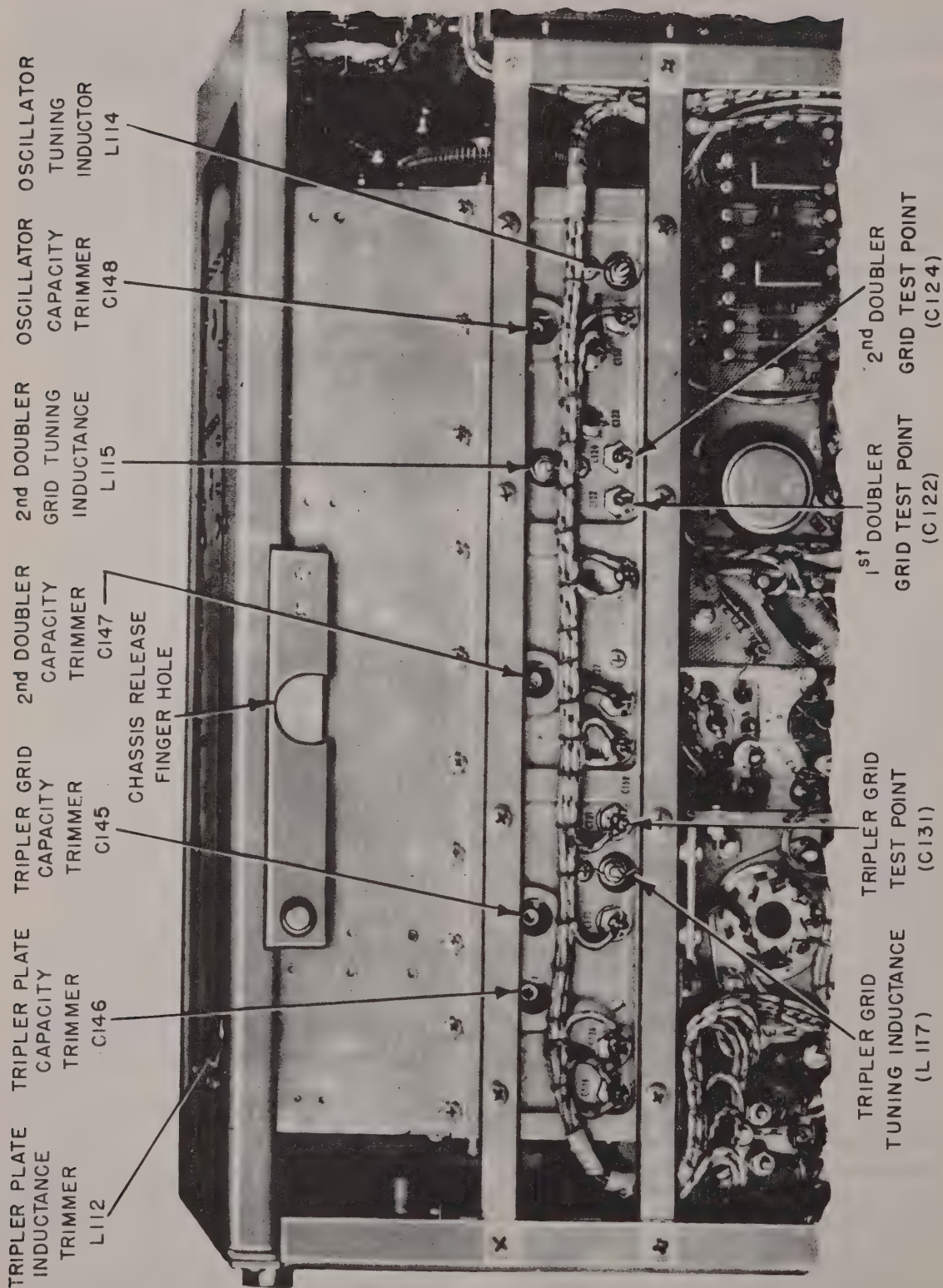


Figure 7-8. Presselector from Bottom of Chassis Showing Alignment Adjusting Screws

TABLE 7-2. AUDIO TEST DATA

TEST POINT	TEST INPUT VOLTAGE (APPROX.)	OUTPUT METER READING
V209, Pin 1	20 millivolts	10 db
V210, Pin 1	350 millivolts	10 db
V211, Pin 1	1 volt	10 db

CONDITIONS: A.F. LEVEL control max, clockwise, ALIGN-REC. switch in REC. position, SILENCER switch in OUT position, N.L. switch in OUT position, receiver detuned and no audio load connected.

INPUT: 1,000 cycles through 0.1 mfd or large capacitor.

TABLE 7-3. INTERMEDIATE FREQUENCY DATA

TEST POINT	INPUT TEST VOLTAGE (APPROX.)	OUTPUT METER READING
Mixer grid inductance Trimmer screws (L111)	16 microvolts	10 db
V201, Pin 1	15 microvolts	10 db
V202, Pin 1	60 microvolts	10 db
V203, Pin 1	500 microvolts	10 db
V204, Pin 1	3000 microvolts	10 db
V205, Pin 1	20,000 microvolts	10 db

CONDITIONS: A.F. LEVEL control max. clockwise, ALIGN-REC. switch in REC. position, SILENCER switch in OUT position, N.L. switch in OUT position, receiver detuned and no audio load connected.

INPUT: 18,600 mc modulated 30% with 1000 cycles through a 0.01 mfd capacitor.

(2) Remove the nuts from the four mounting studs on L301 (underside of chassis).

(3) Lift out L301.

(4) Unsolder the wires from two terminals of capacitor C304 (top of chassis).

(5) Remove the nuts from the two mounting studs on C304 (accessible through holes in right side panel of chassis).

(6) Slip out capacitor C304.

(7) To install a new capacitor, reverse the above procedure, making sure that the leads to C304 and to L301 are connected to their proper respective terminals. If in doubt, consult color coding legend on wiring diagram (figure 7-18).

c. POWER TRANSFORMER T301.

Power transformer T301 is in the right-rear corner of the chassis immediately behind blower BL301, as shown in the top view (figure 1-4). Its removal involves unfastening the rear panel of the chassis and separating it from the chassis far enough to provide an additional half-inch clearance above transformer T301. To do this:

(1) Unsolder the wiring from the terminals of T301 (underside of chassis—figure 2-15), and identify each wire in some manner if there is any likelihood that the preformed arrangement of these wires will be disturbed before connections are restored.

(2) Remove the nuts from the four transformer mounting studs (underside of chassis).

(3) Unfasten the rear panel by removing:

(a) Three screws connecting rear panel to left side panel.

(b) Three screws connecting rear panel to right side panel.

(c) Three screws (horizontal row) connecting rear panel to bed of chassis.

(4) Pull the rear panel away from chassis far enough to permit removal of transformer T301, but no farther, as excessive displacement will place a strain on the leads to connectors P101 and P201, and thermostat S301.

(5) To restore the original transformer, or to substitute a replacement for it, reverse the foregoing procedure, making sure that all transformer leads

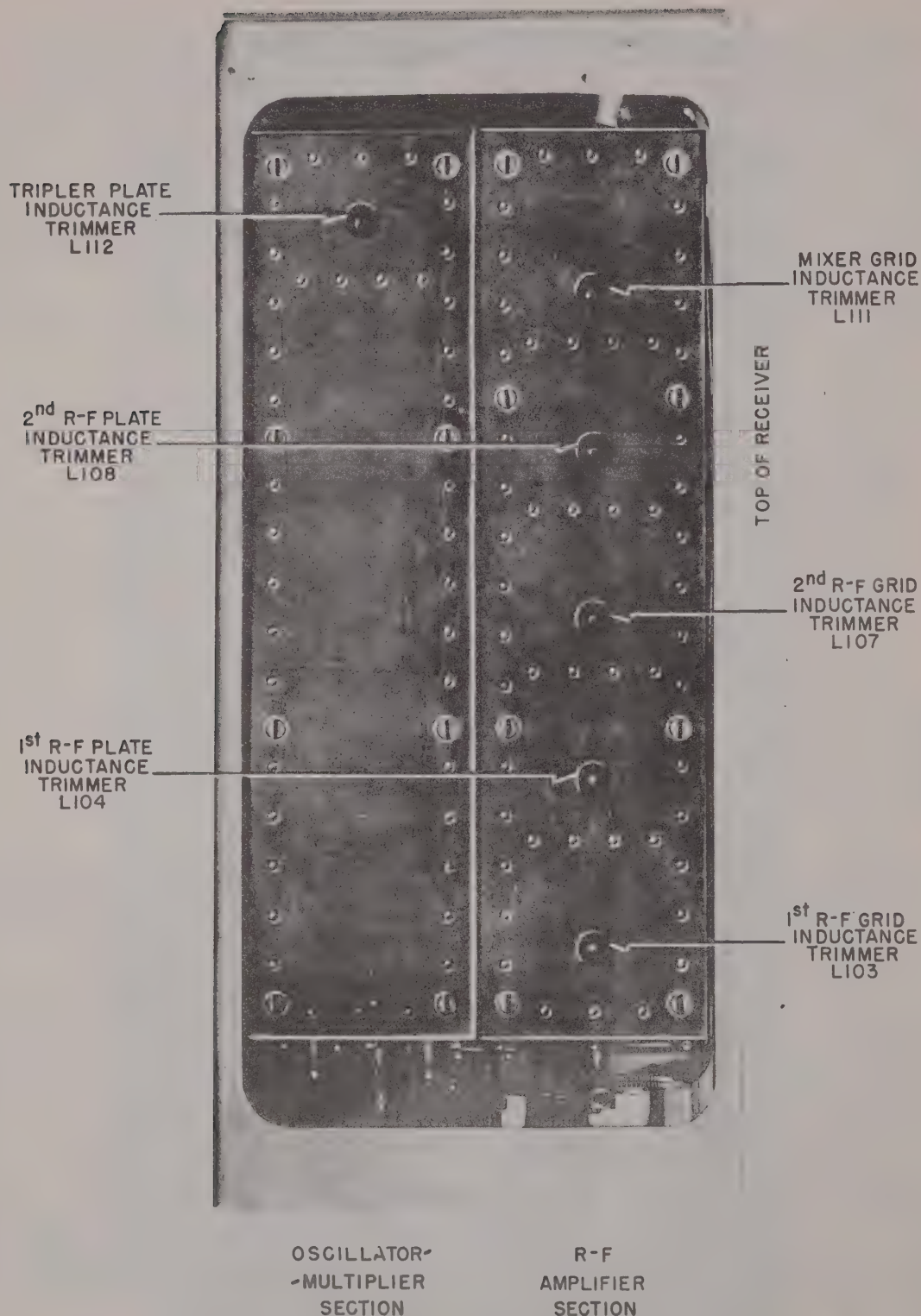


Figure 7-9. Preselector from Left Side of Chassis Showing Alignment Adjusting Screws

are re-connected to the proper respective terminals. If the leads have become mixed, consult the color coding legend on the wiring diagram (figure 7-18).

d. DIAL DRIVE ASSEMBLY (Reference symbol 0-3 in parts list):

The dial drive assembly is located between the front panel and the front sub-panel of the receiver, as shown in figure 1-5. It is further illustrated in figure 6-1. To remove this assembly it will be necessary to remove the entire front panel, so it is suggested that the following procedure be followed closely.

(1) Remove the tuning crank, and the knob on the tuner lock, by using the right-angle portion of the Bristol-type socket wrench provided.

(2) Unsolder the leads to the input and output meters (M501 and M502).

(3) Remove the 11 Phillips-head screws on the front panel which are relatively larger than the remaining 24 similar screws (not including the four large panel fasteners in the corners of the panel), and lower the top of the panel down onto the bench.

(4) Remove the twin-lamp dial light assembly from the top of the dial drive assembly.

(5) Remove the drive arm (0-4 B) of the flexible coupling between the dial drive and the preselector, by loosening the set-screws in its hub.

(6) Remove the four mounting screws which secure the dial drive assembly to the front sub-panel (figure 6-1), making sure that the metal spacers do not get lost.

The procedure for the installation of a new dial drive unit, or the reinstallation of the old one, and replacement of the front panel, etc., is a reversal of the foregoing procedure, except that, after the drive assembly, dial lights and front panel have been replaced, steps must be taken to properly align the calibrated tuning dial (window marked MEGACYCLES) with the position of the capacitor plates in the preselector. To make sure this alignment is correct:

(7) Turn the dial drive input shaft to the left until the number "218" is at top of the calibrated dial (approximate extreme left position of shaft).

(8) Turn the driven member of the flexible coupling (0-4A—attached to preselector input shaft) until the shorter sides of the rotor plates of the ganged capacitors in the preselector are flush with the stator plates, as viewed from the top.

(9) Engage the drive member (0-4B) of the flexible drive with the driven member (0-4A), without disturbing the position of the latter, and secure its hub to the output shaft of the dial drive mechanism.

(10) Insert a crystal of known frequency and tune the receiver to the corresponding carrier frequency (crystal frequency $\times 12$, less 18.6 megacycles).

(11) Note the discrepancy, in dial divisions, between the reading on the calibrated tuning dial and this frequency.

(12) Turn the mechanism to a point where the set screw on the drive member of the flexible coupling is accessible, and loosen same.

(13) With one hand hold the gears on the pre-selector so as to prevent any change in tuning, and with the other hand crank the dial drive through a number of dial divisions equal to the discrepancy.

(14) Tighten the set screw on the drive member of the flexible coupling.

e. PRESELECTOR.

Removal of the body of the preselector and the re-installation of the repaired assembly, or the installation of a replacement assembly, is a relatively simple matter. However some difficulty may be encountered when an attempt is made to coordinate the performance of the ganged capacitors in the pre-selector with the indications on the calibrated tuning dial. It is therefore suggested that the following procedure be followed carefully.

(1) Unsolder those leads which run from the preselector to terminal board E301 (figure 1-5), at E301, and tag each terminal to indicate which lead (of the original assembly or of a substitute assembly) is to be reconnected to it.

(2) Unsolder, in similar manner, those leads which run to terminal board E208.

(3) Unsolder the two leads which connect between the oscillator-multiplier section of the pre-selector unit and the crystal in the left-hand panel compartment.

(4) At transformer T201 (1st i-f transformer) unsolder the two leads of the AN type RG-108/U dual conductor (coupling loop from transformer T122 in the preselector.) From terminals Nos. 3 and 4. Also unsolder the braided shielding from the chassis.

(5) Take off the left side of the chassis by removing:

(a) Three screws entering side plate from rear panel.

(b) Three screws connecting side plate to front panel sub-assembly.

(c) Four screws entering side plate from front panel.

(6) Remove rear panel receptacles P101 and P201 by removing four screws in each.

(7) On top of chassis (figure 7-4): Note the two rails holding preselector in place and:

(a) Detach rail nearer left side of chassis from rear panel and from front panel sub-assembly by removal of two screws.

(b) Detach rail farther from left side of chassis from preselector by removing four screws, but do not remove screws attaching ends to rear panel and front panel sub-assembly.

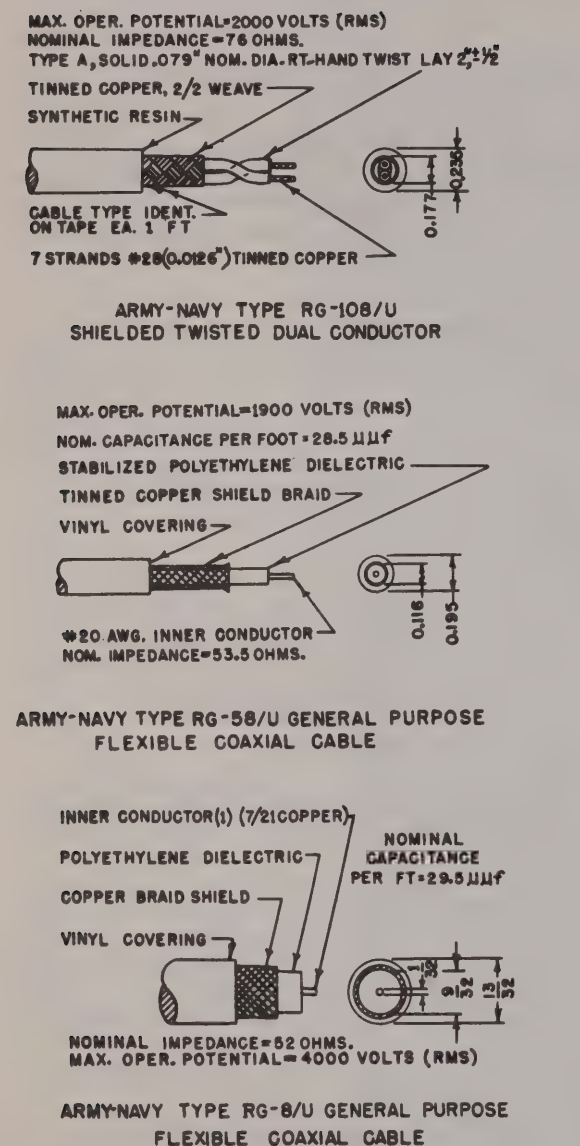


Figure 7-10. Details of R-f and I-f Cables Used in or with Radio Receiving Set AN/URR-13

CAUTION

When removing the screws in the rails holding the preselector in place, as described in steps (7) above and (8) below, care must be taken not to damage the by-pass capacitor terminals on the side of the unit (figure 7-15) by striking them against other parts of the receiver. This may happen if the preselector is allowed to settle into the chassis so that these terminals come in contact with the rails which were not detached.

(8) On bottom of chassis (figure 7-8): Note two similar rails holding preselector in place and detach rail nearer left side from rear panel and front panel sub-assembly, and rail farther from left side from preselector, in similar manner to step No. 6.

(9) Turn tuning crank until "325" appears in window marked MEGACYCLES; this should put the arms of the flexible coupling in a horizontal position.

(10) Withdraw preselector from chassis.

The procedure for re-installation of the preselector, or for the installation of a substitute assembly, is a reversal of the foregoing procedure, except that, after the preselector is properly in place, it will be necessary to coordinate the performance of the preselector with the indications on the calibrated tuning dial. To make sure the latter is correct:

(11) Loosen the set screw in the hub of the driven arm (0-4A) of the flexible coupling (part on preselector), and turn the ganged capacitors until the shorter sides of the rotor plates are flush with the stator plates.

(12) Rotate tuning crank to the left until the number "218" is at the top of the calibrated dial (approximate left limit of crank rotation).

(13) With drive and driven members of the flexible coupling properly engaged, tighten the set screw in the hub of the driven member (0-4A) which was loosened in step No. 10.

(14) Insert a crystal of known frequency and tune the receiver to the corresponding carrier frequency (crystal frequency $\times 12$, less 18.6 megacycles).

(15) Note the discrepancy, in dial divisions, between the reading on the calibrated tuning dial, and this frequency.

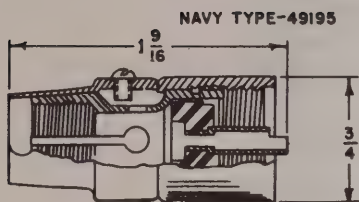
(16) Crank the mechanism to a point where the set screw on the driven member of the flexible coupling is accessible, and loosen same.

(17) Holding the gears on the preselector with one hand so as to prevent any change in tuning, use the other hand to crank the tuning mechanism through a number of dial divisions equal to the discrepancy.

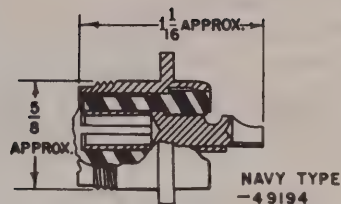
(18) Tighten the set screws on the driven member of the flexible coupling.

6. REPLACEMENT OF R-F CABLES.

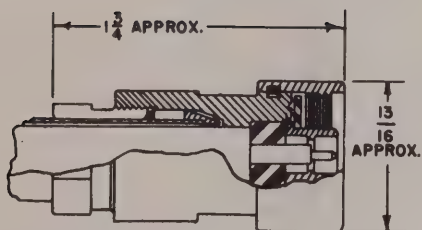
Several lengths of AN type RG-58/U cable are used in the receiver proper and in the cable filter unit, and one length of AN type RG-108/U cable is used in the receiver, as indicated in the wiring diagram of figure 7-18. Unless subjected to physical abuse or abnormal conditions of operation, these cables should require no further attention. However, to assist maintenance personnel in the event that replacement should be necessary, cross-section diagrams of these cables, and of all r-f connectors used, are shown in figures 7-10 and 7-11.



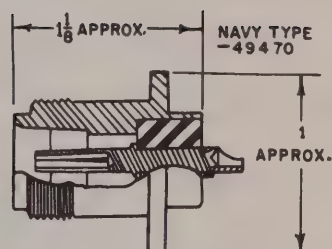
50-OHM SCAN OUTPUT PLUG P403



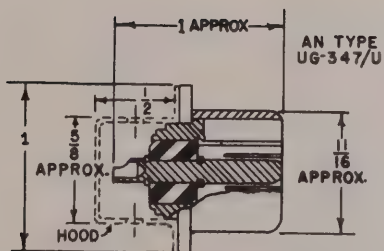
50-OHM SCAN OUTPUT RECEPTACLE
J403



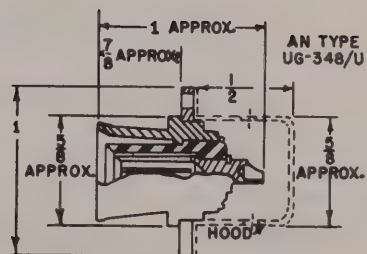
AN TYPE UG-21B/U
50-OHM ANT. INPUT PLUG P404



50-OHM ANT. INPUT RECEPTACLE
J404



ANT. AND SCAN INTERUNIT PLUGS
P101 AND P201



ANT. AND SCAN INTERUNIT RECEPTACLES
J407 AND J406

Figure 7-11. Details of R-f and I-f Connectors Used in or with Radio Receiving Set AN/URR-13

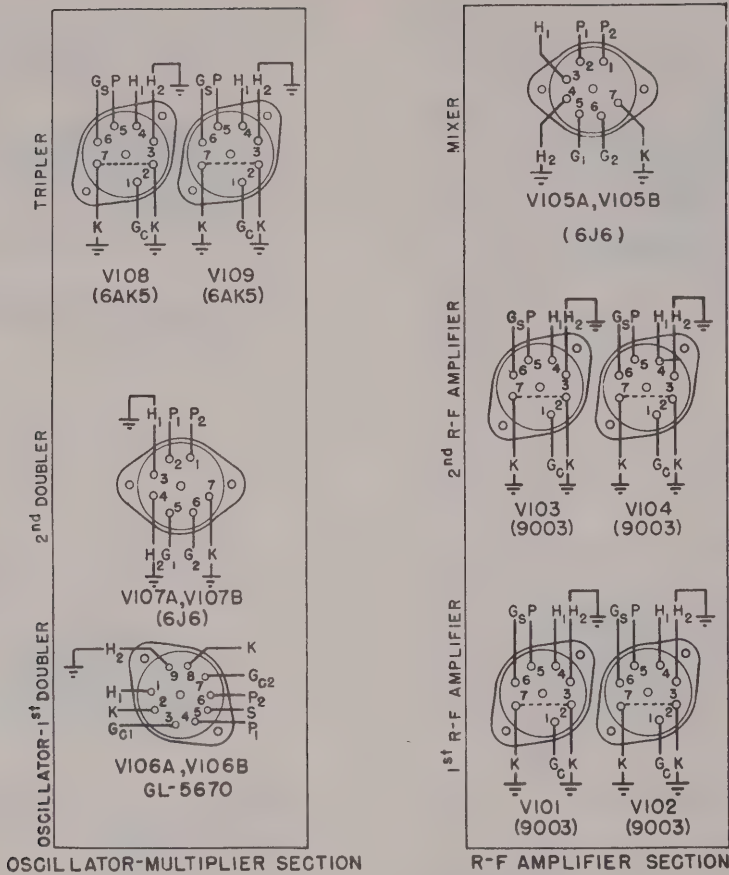


Figure 7-12. Tube Socket Diagrams—Preselector (Top Views)

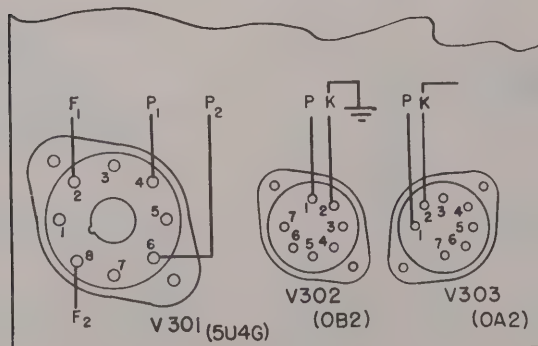


Figure 7-13. Tube Socket Diagrams—Power Supply (Bottom View)

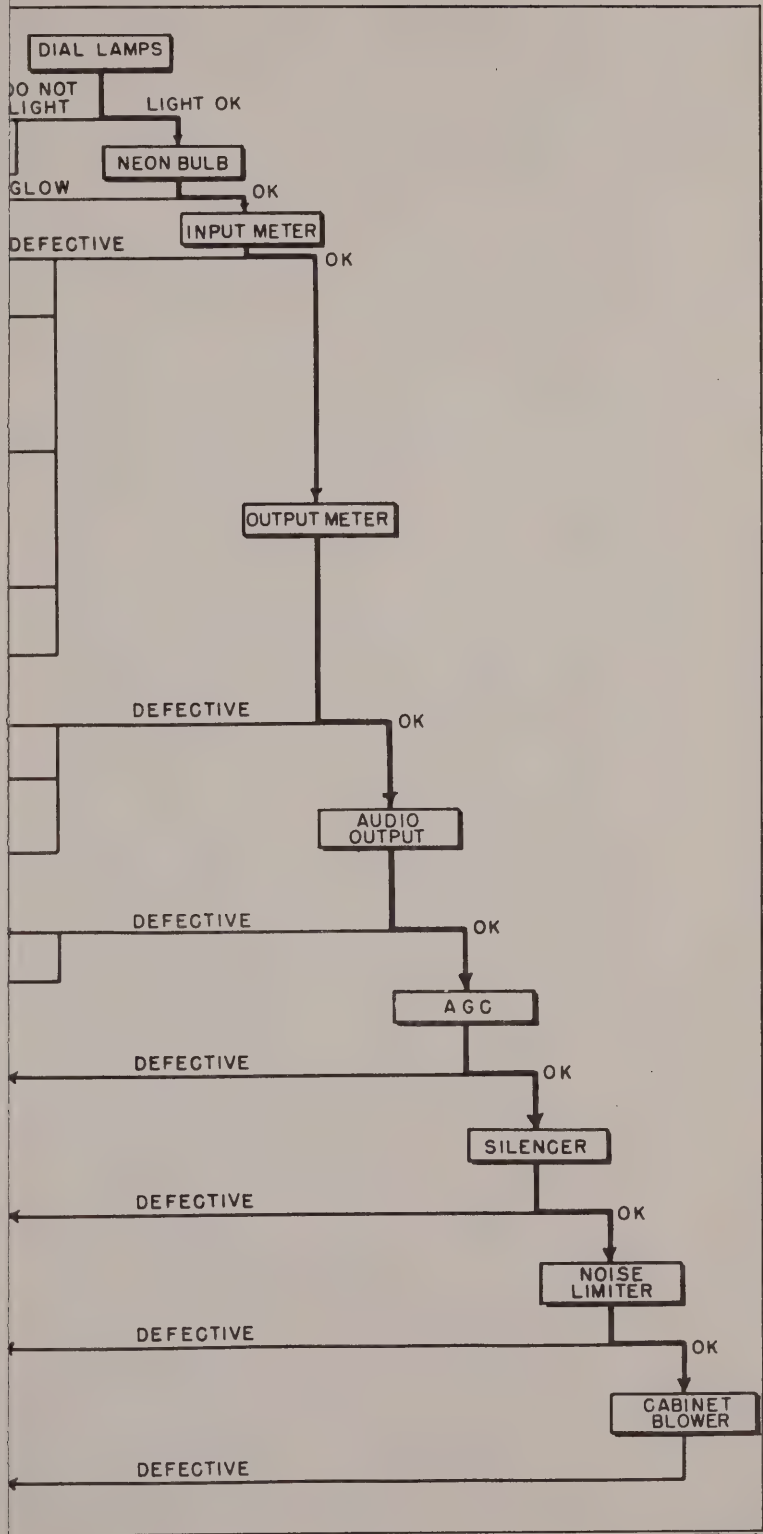


Table 7-4. Trouble Shooting Chart

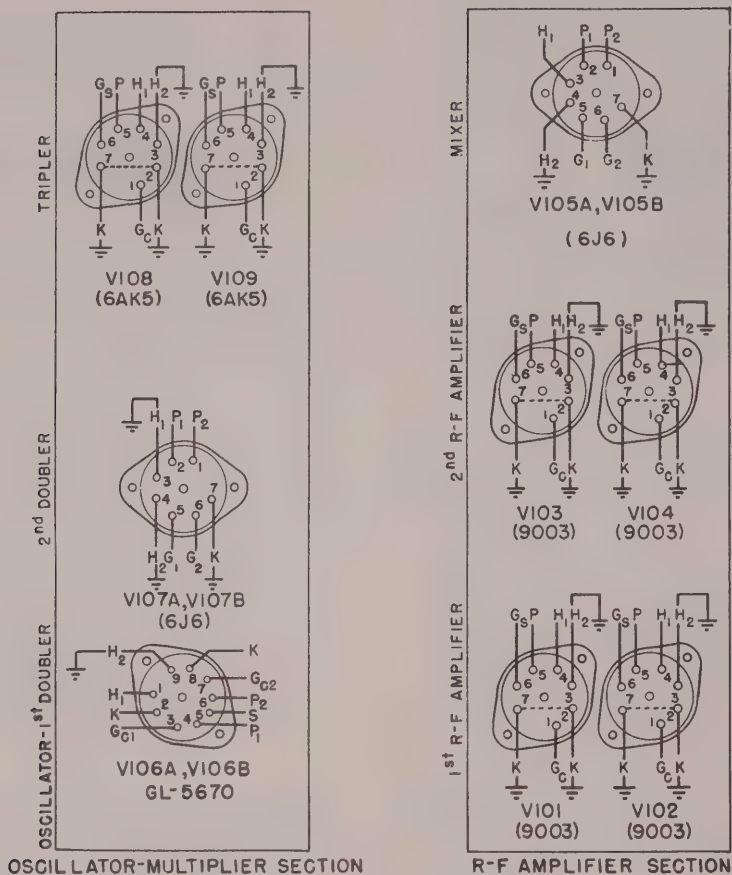


Figure 7-12. Tube Socket Diagrams—Preselector (Top Views)

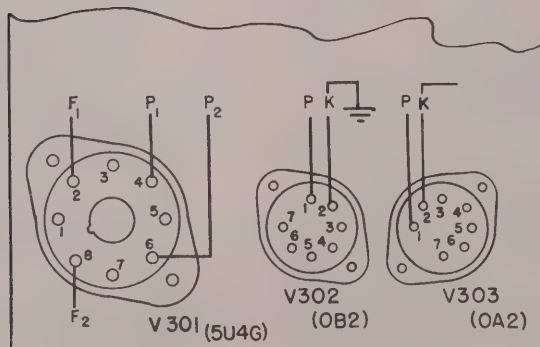


Figure 7-13. Tube Socket Diagrams—Power Supply (Bottom View)

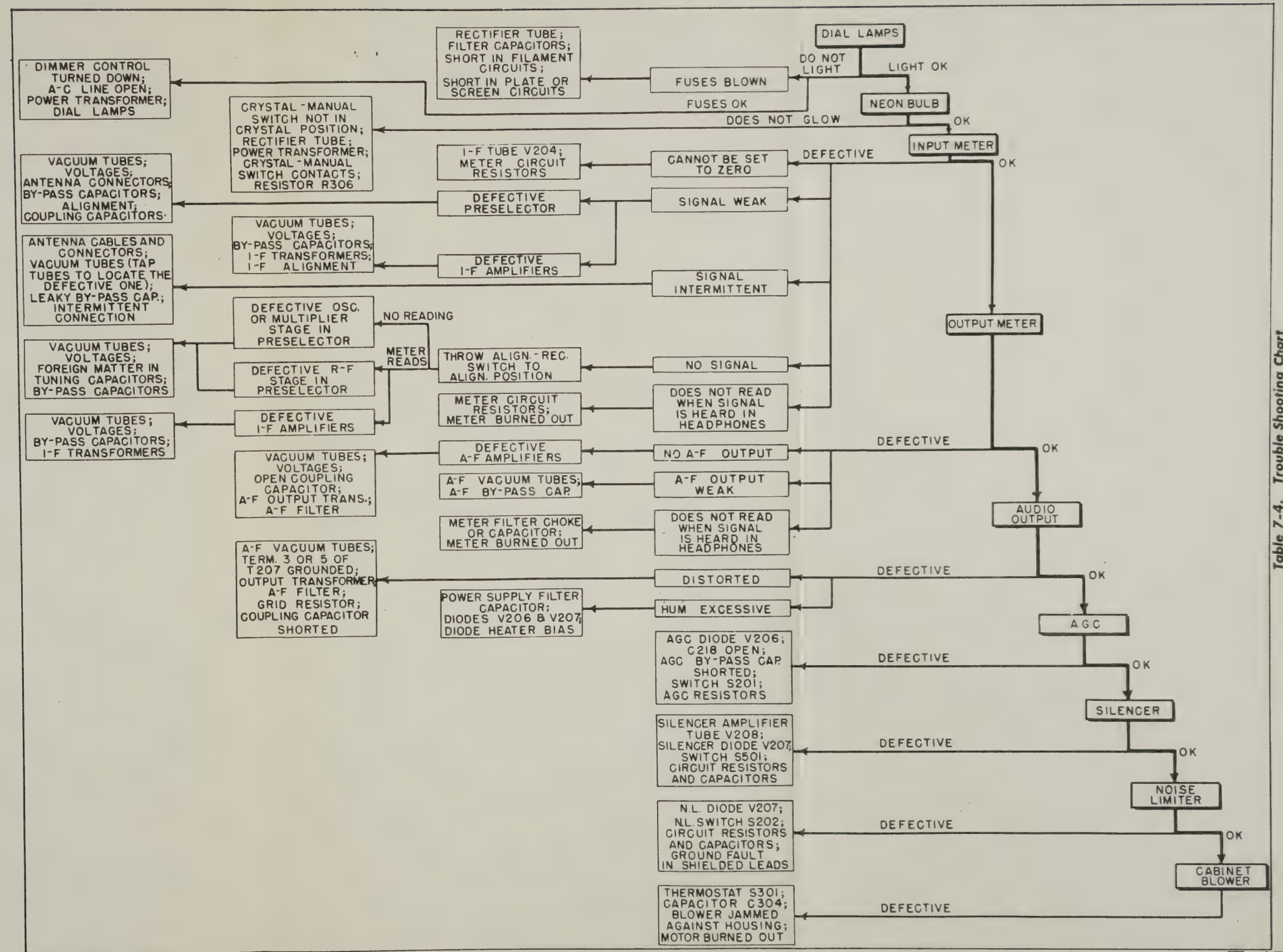


Table 7-4. Trouble Shooting Chart

**TABLE 7-5. VOLTAGE AND RESISTANCE MEASUREMENTS*—FROM ELECTRON TUBE
TERMINALS TO GROUND AND/OR OTHER SIGNIFICANT POINTS**

Symbol and JAN type	Element	Points of Measurement	Potential (volts)	Resistance (ohms)
Radio Receiver R-266/URR-13 — R-F Amplifier Section of Preselector				
Note: Data for tubes in this section not given because tube pins not accessible for making measurements when receiver in operation. For alternate significant measurements see figure 7-15				
Radio Receiver R-266/URR-13 — Oscillator-Multiplier Section of Preselector				
Note: Data for tubes in this section not given because tube pins not accessible for making measurements when receiver in operation. For alternate significant measurements see figure 7-15				
Radio Receiver R-266/URR-13 — IF/AF Section				
V201 (6BA6)	Control Grid	Pin #1	—3.2	280,000
	Suppressor	2	0	0
	Heater	3	5.8 a.c.	0
	Heater	4	0	0
	Plate	5	157.0	30,000
	Screen Grid	6	98.0	30,000
	Cathode	7	2.5	52
V202 (9003)	Control Grid	Pin #1	—3.2	280,000
	Cathode	2	0	0
	Cathode	7	0	0
	Heater	3	5.8 a.c.	0
	Heater	4	0	0
	Plate	5	150	30,000
	Screen Grid	6	95	30,000
V203 (9003)	Control Grid	Pin #1	—3.2	280,000
	Cathode	2	0	0
	Cathode	7	0	0
	Heater	3	5.8 a.c.	0
	Heater	4	0	0
	Plate	5	150	30,000
	Screen Grid	6	95	30,000
V204 (9003)	Control Grid	Pin #1	—3.2	280,000
	Cathode	2	0	0
	Cathode	7	0	0
	Heater	3	5.8 a.c.	0
	Heater	4	0	0
	Plate	5	145	30,000
	Screen Grid	6	93	30,000
V205 (9003)	Control Grid	Pin #1	0	0
	Cathode	2	3.3	550
	Cathode	7	3.3	550
	Heater	3	5.8 a.c.	0
	Heater	4	0	0
	Plate	5	154	30,000
	Screen Grid	6	98	30,000

*Measurements to ground, and voltage dc, unless otherwise indicated.

Conditions of measurement; line voltage, 115 volts, 60 cps; receiver tuned to 300 megacycles; ALIGN-REC switch in REC position; SILENCER switch in OUT position, and N.L. switch in OUT position. Resistance measurements made with power connector (P401/J401) disconnected. All measurements taken with a multimeter ME-5/U series, or a Navy model OBQ series, or equivalent, electronic voltmeter.

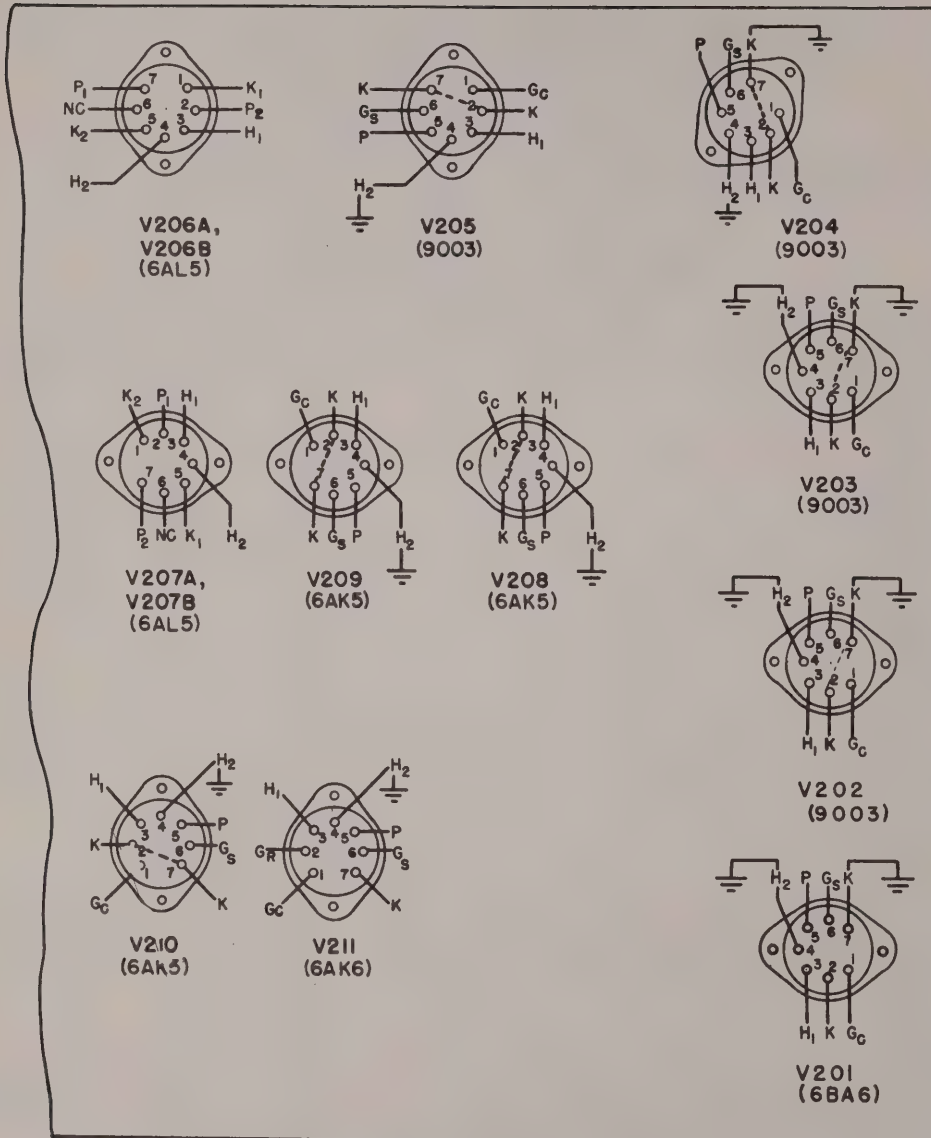


Figure 7-14. Tube Socket Diagrams—IF/AF Section (Bottom View)

TABLE 7-5. (CONT'D.) VOLTAGE AND RESISTANCE MEASUREMENT*—FROM ELECTRON
TUBE TERMINALS TO GROUND AND/OR OTHER SIGNIFICANT POINTS

Symbol and JAN type	Element	Points of Measurement	Potential (volts)	Resistance (ohms)
Radio Receiver R-266/URR-13 — IF/AF Section (Continued)				
V206 (6AL5)	#1 Cathode	Pin #1	—	14,000
	#1 Plate	2	—	310,000
	Heater	3	—6	46
	Heater	4	—6	46
	Heater	3 to Pin 4	6.1 a.c.	—
	#2 Cathode	5	0	14,000
	—	6	—	0
	#2 Plate	7	—	95,000
V207 (6AL5)	#2 Cathode	Pin #1	76	210,000
	#1 Plate	2	—0.3	140,000
	Heater	3	—6	46
	Heater	4	—6	46
	Heater	3 to Pin 4	6.1 a.c.	—
	#1 Cathode	5	+0.3	2,000,000
	—	6	—	∞
	#2 Plate	7	0	330,000
V208 (6AK5)	Control Grid	Pin #1	0.2	800,000
	Cathode	2	7.5	∞
	Cathode	7	0	0
	Heater	3	5.9	0
	Heater	4	0	0
	Plate	5	92	78,000
	Screen Grid	6	100	280,000
V209 (6AK5)	Control Grid	Pin #1	—2.25	1,000,000
	Cathode	2	0	0
	Cathode	7	0	0
	Heater	3	5.9 a.c.	0
	Heater	4	0	0
	Plate	5	87	55,000
	Screen Grid	6	87	55,000
V210 (6AK5)	Control Grid	Pin #1	0	260K
	Cathode	2	0.75	750
	Cathode	7	0.75	750
	Heater	3	5.9 a.c.	0
	Heater	4	0	0
	Plate	5	100	280K
	Screen Grid	6	32	1 meg.
V211 (6AK6)	Control Grid	Pin #1	0	500,000
	Suppressor	2	4.8	250
	Heater	3	5.9 a.c.	0
	Heater	4	0	0
	Plate	5	137	800
	Screen Grid	6	148	28,000
	Cathode	7	4.8	250
Radio Receiver R-266/URR-13 — Power Supply Section				
V301 (5U4G)	NC	Pin #1	—	—
	Filament	2	205	28,000
	NC	3	—	—
	#1 Plate	4	—2.1dc; + 228ac	90
	NC	5	—	—
	#2 Plate	6	—2.1dc; + 228ac	90
	NC	7	—	—
	Filament	8	205	28,000

*Measurements to ground, and voltage dc, unless otherwise indicated.

Conditions of measurement; line voltage, 115 volts, 60 cps; receiver tuned to 300 megacycles; ALIGN-REC switch in REC position; SILENCER switch in OUT position, and N.L. switch in OUT position. Resistance measurements made with power connector (P401/J401) disconnected. All measurements taken with a multimeter ME-5/U series, or a Navy model OBQ series, or equivalent, electronic voltmeter.

TABLE 7-5. (CONT'D.) VOLTAGE AND RESISTANCE MEASUREMENT*—FROM ELECTRON TUBE TERMINALS TO GROUND AND/OR OTHER SIGNIFICANT POINTS

Symbol and JAN type	Element	Points of Measurement	Potential (volts)	Resistance (ohms)
Radio Receiver R-266/URR13 — Power Supply Section (Continued)				
V302 (OB2)	Anode	Pin #1	105	28,000
	Cathode	3	0	0
	NC	3	—	—
	NC	4	—	—
	NC	5	—	—
	NC	6	—	—
	NC	7	—	—
V303 (OA2)	Anode	Pin #1	150	28,000
	Cathode	2	-6	45
	NC	3	—	—
	NC	4	—	—
	NC	5	—	—
	NC	6	—	—
	NC	7	—	—

*Measurements to ground, and voltage dc, unless otherwise indicated.

Conditions of measurement; line voltage, 115 volts, 60 cps; receiver tuned to 300 megacycles; ALIGN-REC switch in REC position; SILENCER switch in OUT position, and N.L. switch in OUT position. Resistance measurements made with power connector (P401/J401) disconnected. All measurements taken with a multimeter ME-5/U series, or a Navy model OBQ series, or equivalent, electronic voltmeter.

NOTE 1: VALUES SHOWN ARE D-C VOLTAGES
UNLESS OTHERWISE INDICATED

NOTE 2: FOR CONDITIONS OF MEASUREMENT
SEE PARAGRAPH 2C OF THIS SECTION.

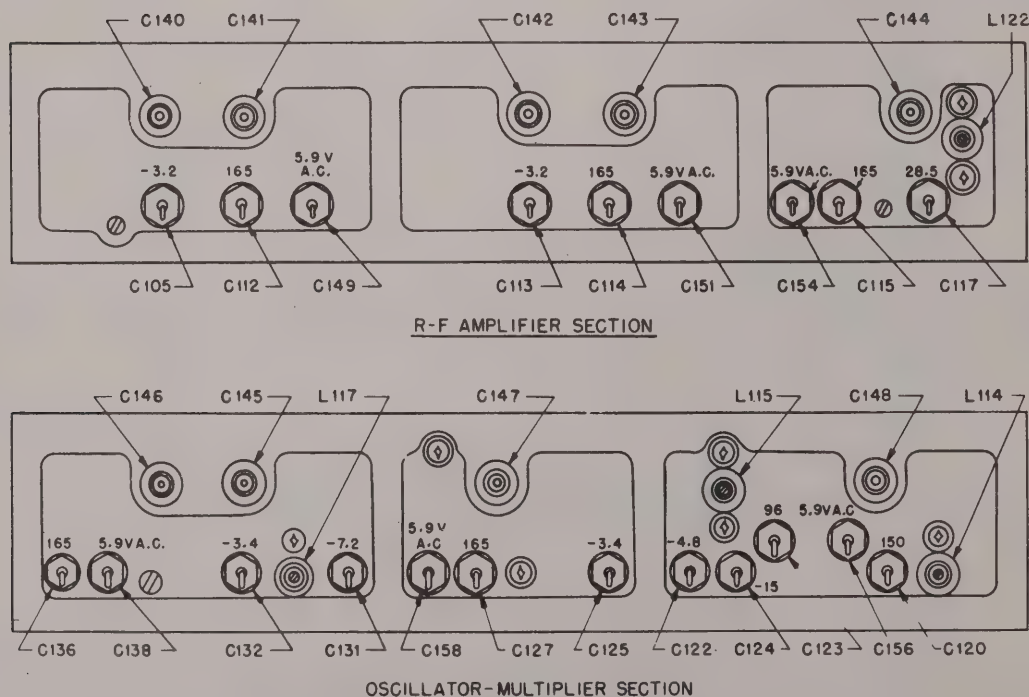
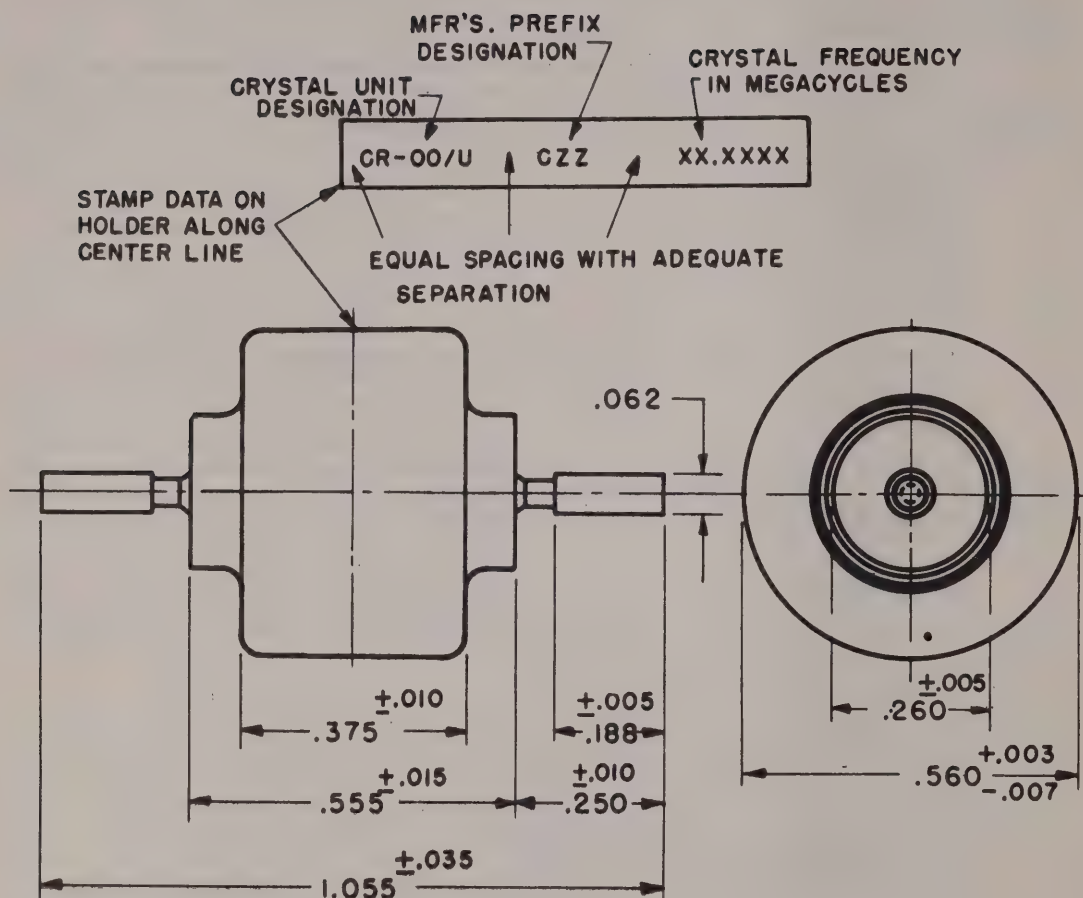
**Figure 7-15. Voltage Diagram—Significant Voltage Measurements at Points on Presetor**

TABLE 7-6. VOLTAGE AND RESISTANCE MEASUREMENTS*—TERMINAL BOARD
CONNECTIONS TO GROUND, AND/OR OTHER SIGNIFICANT POINTS

Terms. at Which Readings Made		Potential		Resis. (Ohms)	Terms. at Which Readings Made		Potential		Resis. (Ohms)
From	To	Volts D. C.	Volts A. C.		From	To	Volts D. C.	Volts A. C.	
The following terminals are located on term. board E303 in Pwr. Supply Section.					The following terminals are located on term. board E208 in IF/AF Section.				
1	Ground	—0.65	5.6	∞	31	Ground			
2	Ground	—6.7	15	40	32				
3	Ground	—6.7	15	40	33				
4	Ground	0	0	0	34	Ground	-3.2		180,000
5	Ground	0	5.9	0	35	Ground	-3.4		20
6	Ground	—3.4	7.3	20	36	Ground	-7.2		40,000
7	Ground	165	0	28,000	The following items are located on terminal board E202 in IF/AF Section.				
8	Ground	103	0	27,000	R253 (Term. near front of chassis) R253 (Term. wired to R234)	Ground	103		
9	Ground	0	58	∞		Ground	5.5		
10	Ground	—6.5	0	∞					
11	Ground			3					
12	Ground	0	0	3					
13	Ground	144	0	28,000					
14	Ground	—0.25	54	∞					
15	Ground	103	0	170,000					
The following terminals are located on terms. board E301 in Pwr. Supply Section.									
21	Ground	0	5.9	0					
22	Ground	0	5.9	28,000					
23	Ground	165	0	28,000					
24	Ground	0.25	54	∞					
25	Ground	0	0	0					
26	Ground	—0.6	57	∞					

* Conditions of measurement: line voltage 115 volts, 60 cps; receiver tuned to 300 megacycles; ALIGN-REC switch in REC position; SILENCER switch in OUT position; and N.L. switch in OUT position. Resistance measurements made with power connector (P401/J401) disconnected. All measurements made with a multimeter ME-5/U series, or a Navy model OBQ, or equivalent, electronic voltmeter.



1. FREQUENCY RANGE OF CRYSTALS USED = 20.1125 TO 35.2167 MC.
2. INTERMEDIATE FREQUENCY OF RECEIVER = 18.6 MC.
3. HETERODYNE FREQUENCY RANGE = 241.35 TO 422.60 MC.
4. METHOD OF MULTIPLICATION = CRYSTAL FREQUENCY X2X2X3; SEE SCHEMATIC DIAGRAM, FIGURE (2-5)
5. TEMP. CHARACTERISTIC = $\pm 0.005\%$ DEVIATION BETWEEN -55°C (-67°F) AND $+90^{\circ}\text{C}$ ($+194^{\circ}\text{F}$).
6. TEMPERATURE OF OPERATION AND CALIBRATION = -55°C (-67°F) TO $+90^{\circ}\text{C}$ ($+194^{\circ}\text{F}$)
7. MODE OF OPERATION = 5 TH MODE FOR 25-50 MC.; 3RD MODE FOR 15-25 MC.

Figure 7-16. Outline and Data—Crystal Unit CR-24/U

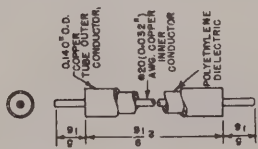
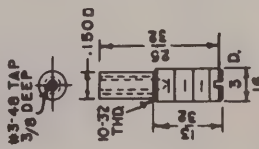
TABLE 7-7. RATED TUBE CHARACTERISTICS

Tube Type	Filament Voltage (v)	Filament Current (amps)	Plate Voltage (v)	Grid Bias Voltage (v)	Screen Voltage (v)	Plate Current (ma)	Screen Current (ma)	A-c Plate Resistance (ohms)	Voltage Amplification Factor	Transconductance (Micromhos)		Emission	
										Normal	Minimum	I _s	Test Volts
0A2	Cold Cathode	—	—	—	—	5-30 cont. 75 max. start	—	—	—	—	—	—	—
0B2	Cold Cathode	—	—	—	—	5-30 cont. 75 max. start	—	—	—	—	—	—	—
5670	6.3	0.30	150 (300 max)	—2.0	—	8.2 per section (18 per sec. max)	—	—	35	5500	—	—	—
6AK5	6.3	0.175	150 (180 max)	(330 Cathode Bias)	140 (140 max)	7.0	2.2	420,000	—	4300	—	—	—
6AK6	6.3	0.15	180 (300 max)	—9.0	180 (250 max)	15	2.5	200,000	—	2300	—	—	—
6BA6	6.3	0.30	250 (300 max)	—20.0	100	11	4.2	150,000	—	4400	—	—	—
6J6	6.3	0.45	150 (300 max)	—10.0	—	8.5	—	7100	38	5300	—	—	—
9003	6.3	0.15	(250 max)	—3.0	(100 max)	6.7	2.7	700,000	—	1800	—	—	—
	Filament Voltage (v)	Filament Current (amps)	Peak In-Voltage (v)	Peak In-Cathode Current (ma)	Max. Plate Voltage (v) per plate	D-c Output Current (ma) per plate	D-c Voltage on Heater Cathode (v)						
5U4G	5.0	3.0	1550	675	550	225	—						
6AL5	6.3	0.3	420	54	—	9 max	330						

TABLE 7-8. COIL WINDING DATA—ALL WIREWOUND PARTS, EXCEPT RESISTORS

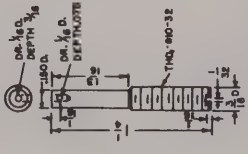
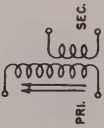
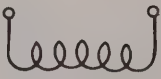
Radio Receiver R-266/URR-13—Preslector										
Circuit Symbol	FTRC Drawing Number	Schematic Diagram	Winding	Coil Form	Wire and Size	No. of Turns and Loc. Taps	D-C Resis. (Ohms)	Inductance	"Q" (and Freq.)	Remarks
L101	FRB-10086-1			None	3/16" O.D. x 0.025" wall S.D. seamless round copper tube	90° Elbow (5/32" inside radius)				See ass'y diagram. Tube 0.0005" silver plate.
L114	FRA-18729-2			7/16" diam. ceramic tube, FTRC Dwg. FRA- 20302-1	#20 AWG bare tinned S.D. copper*	14 Tap at 5-11/16 turns from mtg. base end (incl. term. clip).		1.4 μh		Single layer wound; Powdered iron slug on threaded brass stud for inductance ad- justment.
L115	FRA-18730-2		Grid & plate wdgs. inter- spaced in double helix	7/8" diam. mica filled bakelite tube, FTRC Dwg. FRP- 17877-14-3	#20 AWG bare * tinned soft copper	Grid: 6 turns, tap at 2-7/8; Plate: 5-3/8 turns	0.01	0.34 μh at 10mc & 20 mc, & 100 dcma		Both wdgs. space wound at 8 t.p.i.; Coated with "Q-max. A-27" (tropicalized) and baked dry at 60° C; Powdered iron slug on threaded brass stud for inductance ad- justment.

* Per A.S.T.M. Spec. B33-46

L116	FRA-18731-2				7/16" diam. mica-filled bakelite tube. FRP- Dwg. FRP- 17877-14-4	#20 AWG bare tinned soft cop- per* per*	9; tap at 5 turns from mtg. base end.	0.01	0.58 μ h at 10mc & 20 mc, & 100 dcma	Wound at 14 t.p.i. Coated with "Q-max." A-27" (tropicalized) and baked dry at 60° C. Powdered iron slug on brass stud for induc- tance adjustment
L117	FRA-18732-2				7/16" diam. mica-filled bakelite tube. FRP- Dwg. FRP- 17877-14-5	#20 AWG bare tinned soft cop- per* per*	3; Ctr. tap at 1-1/2 turns	0.007	0.09 μ h at 25mc & 50 mc, & 100 dcma	Wound at 5 t.p.i. Mov- able brass core for inductance adjust- ment
L118	FRA-10087-1				None	Coaxial: 0.032" diam. inner con- ductor; polyethy- lene insul- ation; cop- per tube outer con- ductor; 0.140" O.D.	Straight section 3-3/16" lg, incl. 5/16" stripped ends.			0.0002" silverplate
L119 L120	FRB-18733-1									

* Per A.S.T.M. Spec. B33-46

TABLE 7-8. (CONT'D.) COIL WINDING DATA—ALL WIREWOUND PARTS EXCEPT RESISTORS

Circuit Symbol	FTRC Drawing Number	Schematic Diagram	Winding	Coil Form	Wire and Size	No. of Turns and Loc. Taps	D-C Resist. (Ohms)	Inductance	"Q" (and Freq.)	Remarks
L121	FRB-6204-1									
L122	FRA-18728-2		Primary (at mtg. base end) Secondary (at free end)	7/8" diam. bakelite tube FTRC Dwg. FRF-17877- 14-6	#26 AWG bare tinned soft copper* #26 AWG bare tinned soft copper*	7-1/4 1-5/6		0.75h 0.15h		Coated with "Q-max. A-27" (tropicalized) and baked dry at 60° C. Powdered iron slug on threaded brass stud for inductance ad- justment. Both dwgs. at 28 t.p.i.
L123	FRA-20493-1			5/32" diam. x 1/2" lg. bakelite rod, FTRC Dwg. FRP- 20492-1	#30 AWG SC enam. copper magnet	27	0.133 ±10%	1.2 μh ±5%	80, ±10% at 25 mc	Close wound rt. or lt. hand. Preheated (100° C.); dipped in "Q-max A-27" (tropicalized), and baked dry at 60° C.

* Per A.S.T.M. Spec. B-33-46

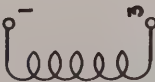
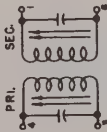
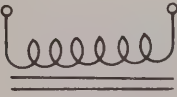
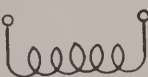
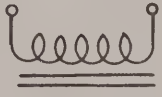
Radio Receiver R-266/URR-13—I/F/AF Section										
L201 thru. L211	FRA-511-1			13/64" diam. x 5/8" lg. phenolic form. FTFC Dwg. FRP- 512-1	#30 AWG SC enam, copper magnet	45	0.255, ±10%	3 μ h ±5%	50, ±10% at 25 mc	Preheated (100° C.), dipped in "Q-max A-27" (tropicalized), and baked dry at 60° C. Close wound; rt. or lt. hand
T201	FRE-20810-3-2		Sec. Pri.			8, at 28 t.p.i. (starts 1/4" from bottom) 2, at 28 t.p.i. (starts 1 turn from sec, on same form)				Powdered iron core (ad- justable from bot- tom) in secondary 100 μ mf capacitor & 4700 ohm, 1/2-watt resistor each in parallel with sec. Nominal tuned freq. =18.6 mc. Per FTFC Spec. RC- 7804-1
T202 T203 T204 T205 T206	FRE-20810-3-1		Sec. Pri.			8, at 28 t.p.i. (8th turn spaced 7 turns from rest) 8, at 28 t.p.i. (turns 2-7 spaced 7 turns from first).			120 120	Start sec. wdg. 1-1/4" from bottom. Leave 9 spaced turns be- tween sec. and pri. wdgs. 100 μ mf capacitors in shunt with pri. and sec. wdgs. 18.6 nominal res. Powdered iron cores ad- justable one from top and one from bottom. Per FTFC spec. RC- 7804-1

TABLE 7-8. (CONT'D.) COIL WINDING DATA—ALL WIREWOUND PARTS EXCEPT RESISTORS

Circuit Symbol	FTRC Drawing Number	Diagram	Schematic Winding	Coil Form	Wire and Size	No. of Turns and Loc. Taps	D-C Resist. (Ohms)	Inductance	"Q" (and Freq.)	Remarks
T207	RC-7899-1		Pri.	Silicon steel core; steel enclosing frame	#40E	2600	710	15h		180 v. to grnd. Turns ratio = 12.4/. Freq. response = ± 2 db, 350-3500 cps. Electrostatic shield between windings Impedance ratio=100,-000/60 Per FTRC Spec. RC-7898-1
			Sec.		#29E	210	5.3			
Radio Receiver R-266/URR-13—Power Supply Section										
L301	RC-8113-1					Humbucking tap $\pm 15\%$ at 11.4% of turns	350	12 h, $\pm 15\%$ at 145 dcma & 10 v, 60 cps, rms.		1600 v rms test Per FTRC spec. RC-8112-1 320 v peak wkg.
T301	RC-8115-1		Pri. #1 Pri. #2 Pri. #3 Sec. #4 Sec. #1		#22E #22E #22E #24E #17E	297 310 324 18, C.T. 14 : 1/2	2.38 2.48 2.60 0.32 0.055	Voltage & terminals 110 v at 1 & 2 115 v at 1 & 3 120 v at 1 & 4 6.3 v, 0.6 amps at 10, 11 (C.T.) & 12 5 v, 3.3 amps at 8 & 9	1 phase, 50/60 cps, 1 amp input Per FTRC spec. RC-8114-1 and FTRC schematic RC-8116-1 Electrostatic shield between pri. and sec. wdgs. Shield grndd. to case	

Radio Receiver R-266/URR-13—Power Supply Section									
T301 Cont'd		Sec. #2	2 X #19E	18	0.055	6.3 v, 3.8 amps at 13 & 14			
		Sec. #3	#30E	1320 C.T.	85	470 v, 0.145 amps at 5, 6 (C.T.) & 7			
Radio Receiving Set, AN/URR-13—Band Suppression Filter, F-89/URR-13									
L401 L402			5/8" diam. x 1-11/16" lg. phenolic tube, FTRC Dwg. FRP- 2700-1	#22 DCC copper magnet	3 pies; 80 turns per pie	1.12	1.26 mh ±10% at 1.5 d-c amps.	25 at 225kc ±10%	Universal wdg. Cp=4 μuf, ±1 μuf 1" lg. iron core ce- mented inside coil form at 9/32" from free end.
L403 L404 L407 L408			3/8" diam. x 1-3/8" lg. phenolic rod form. FTRC Dwg. FRP-2721-1	#22 enam. copper magnet	7-1/2	0.013	0.359 μh ±10% at 10 mc & at 20 mc, at 2 d-c amps	100 ±10% at 14 mc	Preheated (100° C.), dipped in "Q-max A-27" (tropicalized), and baked dry at 60° C.
L405 L406			5/8" diam. x 1-11/16" lg. phenolic tube, FTRC Dwg. FRP- 2700-1	#26 DCC copper magnet	3 pies; 70 turns per pie	1.96	1.08 mh ±10% at 300 dcma	30 ±10% at 262 kc	Universal wdg. 100 v rms test Cp=2 μuf ±0.5 μuf 1" lg. iron core ce- mented inside coil form 9/32" from free end Preheated (100° C.), dipped in "Q-max A-27" (tropicalized) and baked dry at 60° C.

NOTES

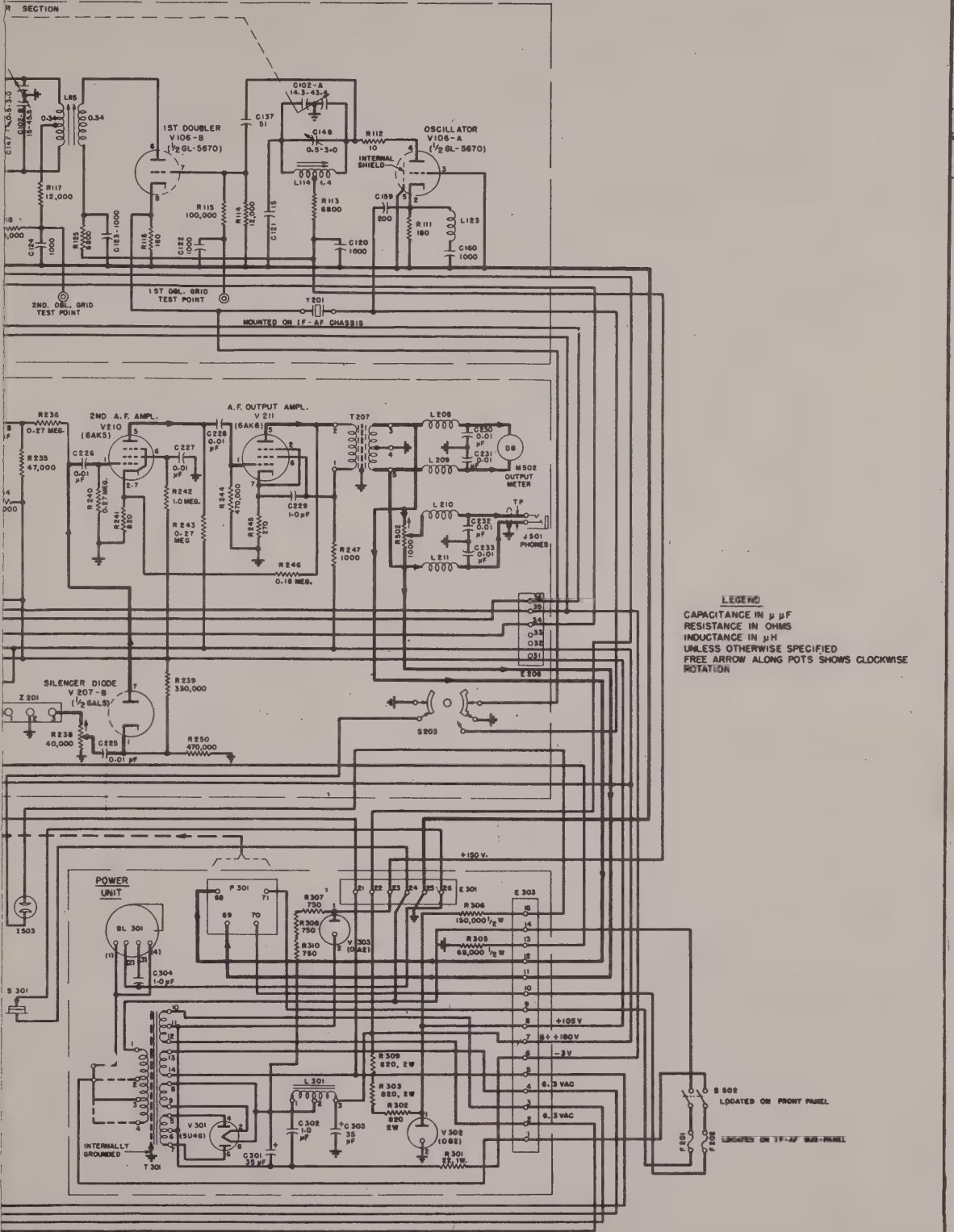


Figure 7-17. Schematic (Overall)—Radio Receiver R-266/URR-13

NOTES

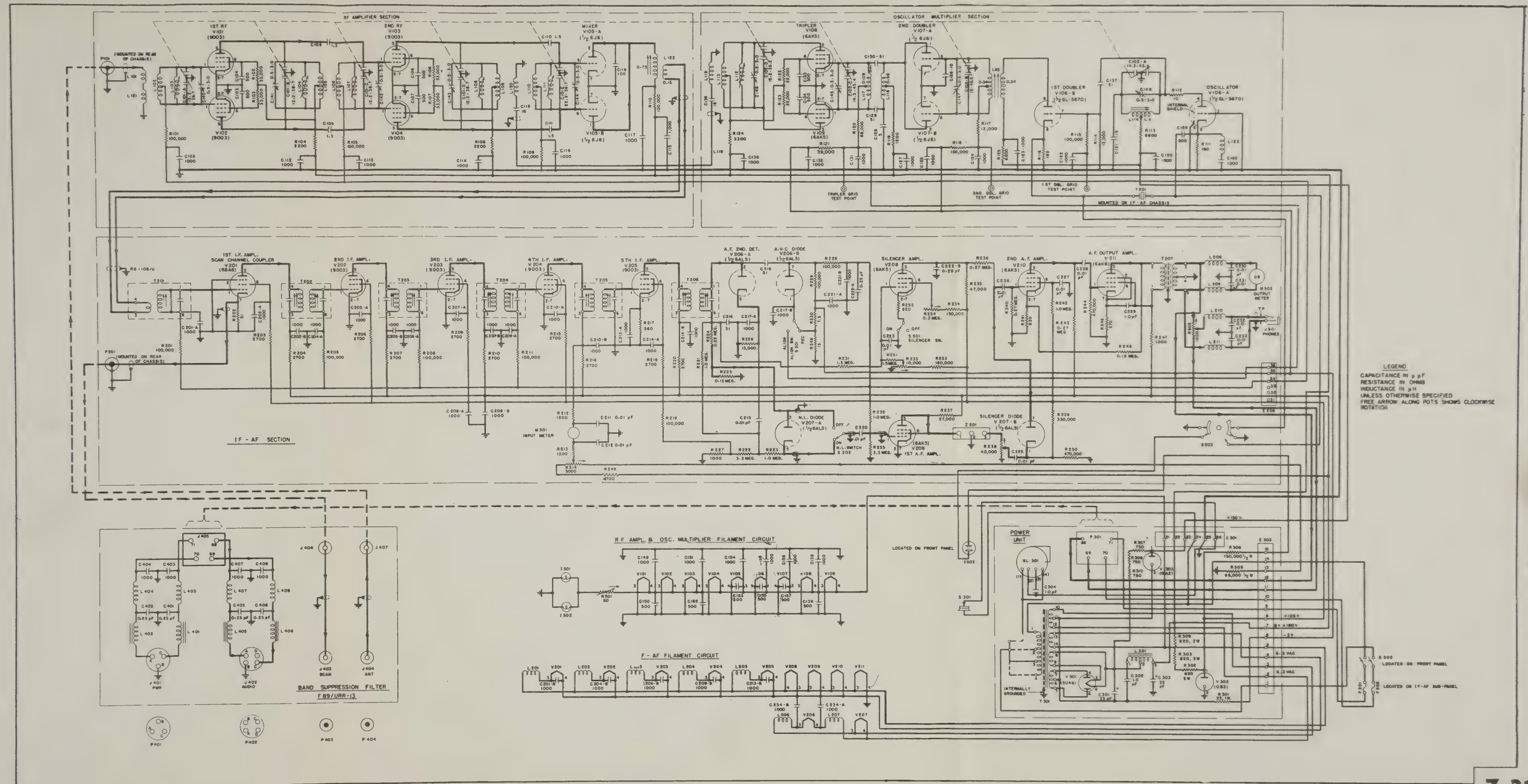
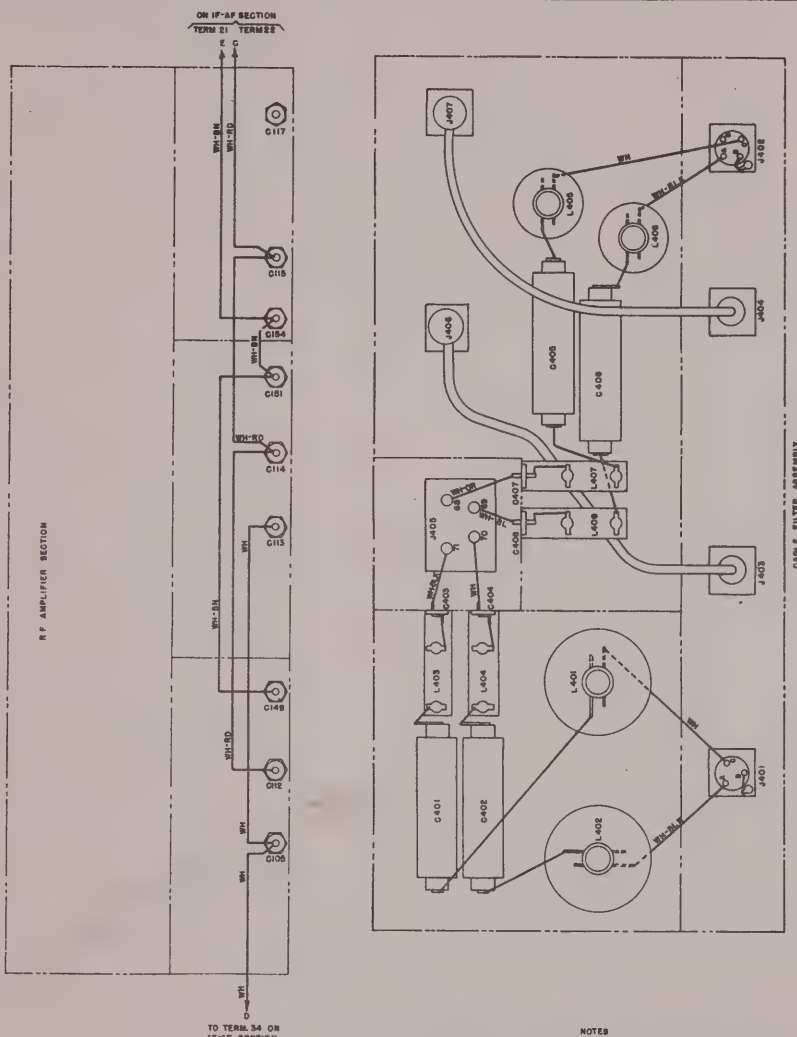


Figure 7-17. Schematic (Overall)—Radio Receiver R-266/URR-13

CORRECTIVE
MAINTENANCE

NAVSHIPS 91270
AN/URR-13

Section 7



NOTES

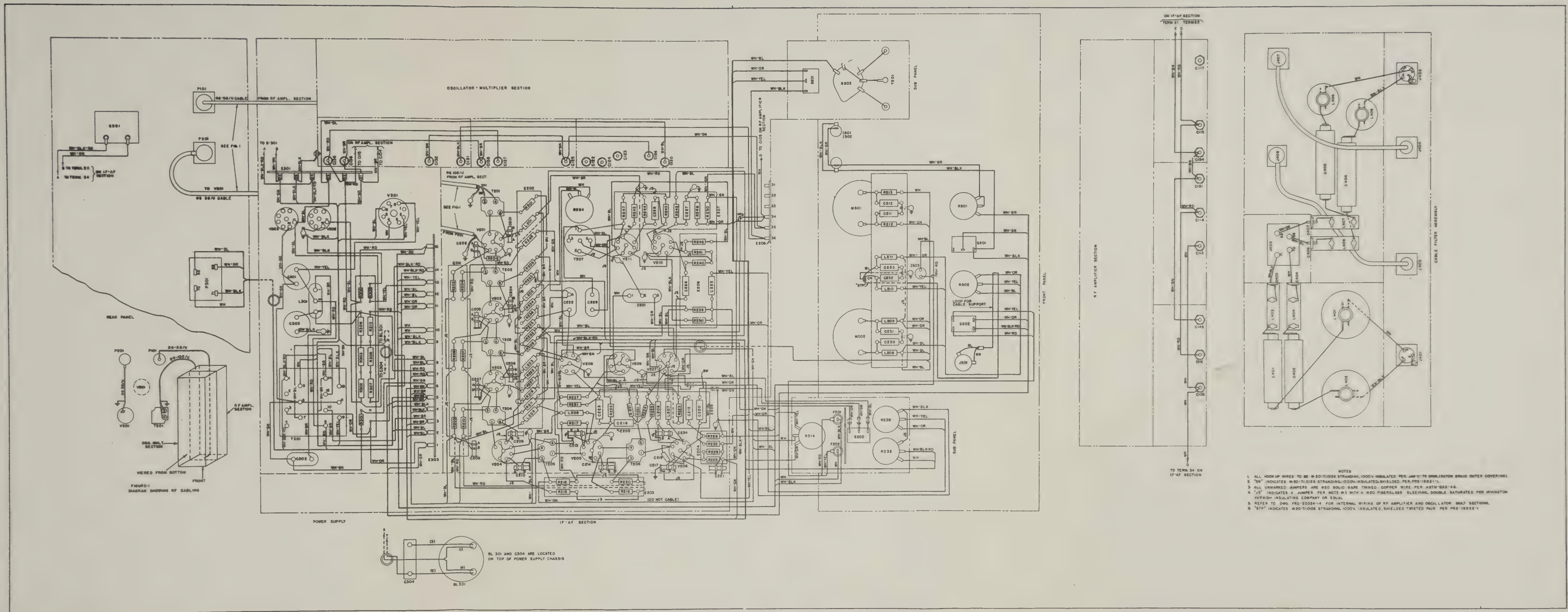
1. ALL NOOK UP WIRES TO BE #20-7/028 STRANDING, 1000V INSULATED PER JAN-C-76 BRW (RAYON BRAID OUTER COVERING).
2. "SM" INDICATES #20-7/028 STRANDING, 1000V INSULATED, SHIELDED PER PRS-18851-1.
3. ALL UNMARKED JUMPERS ARE #20 SOLID BARE THINNED COPPER WIRE PER ASTM-B35-46.
4. "JB" INDICATES A JUMPER PER NOTE #3 WITH A #20 FIBERGLASS SLEEVING, DOUBLE SATURATED PER IRVINGTON VARNISH INSULATING COMPANY OR EQUAL.
5. REFER TO DWG. PRO-20324-14 FOR INTERNAL WIRING OF RF AMPLIFIER AND OSCILLATOR MULT. SECTIONS.
6. "STP" INDICATES #20-7/028 STRANDING, 1000V INSULATED, SHIELDED TWISTED PAIR PER PRS-18851-1.

Figure 7-18. Wiring Diagram—Receiver Chassis and Band Suppression Filter F-89/URR-13

ORIGINAL

7-33
7-34

CORRECTIVE MAINTENANCE



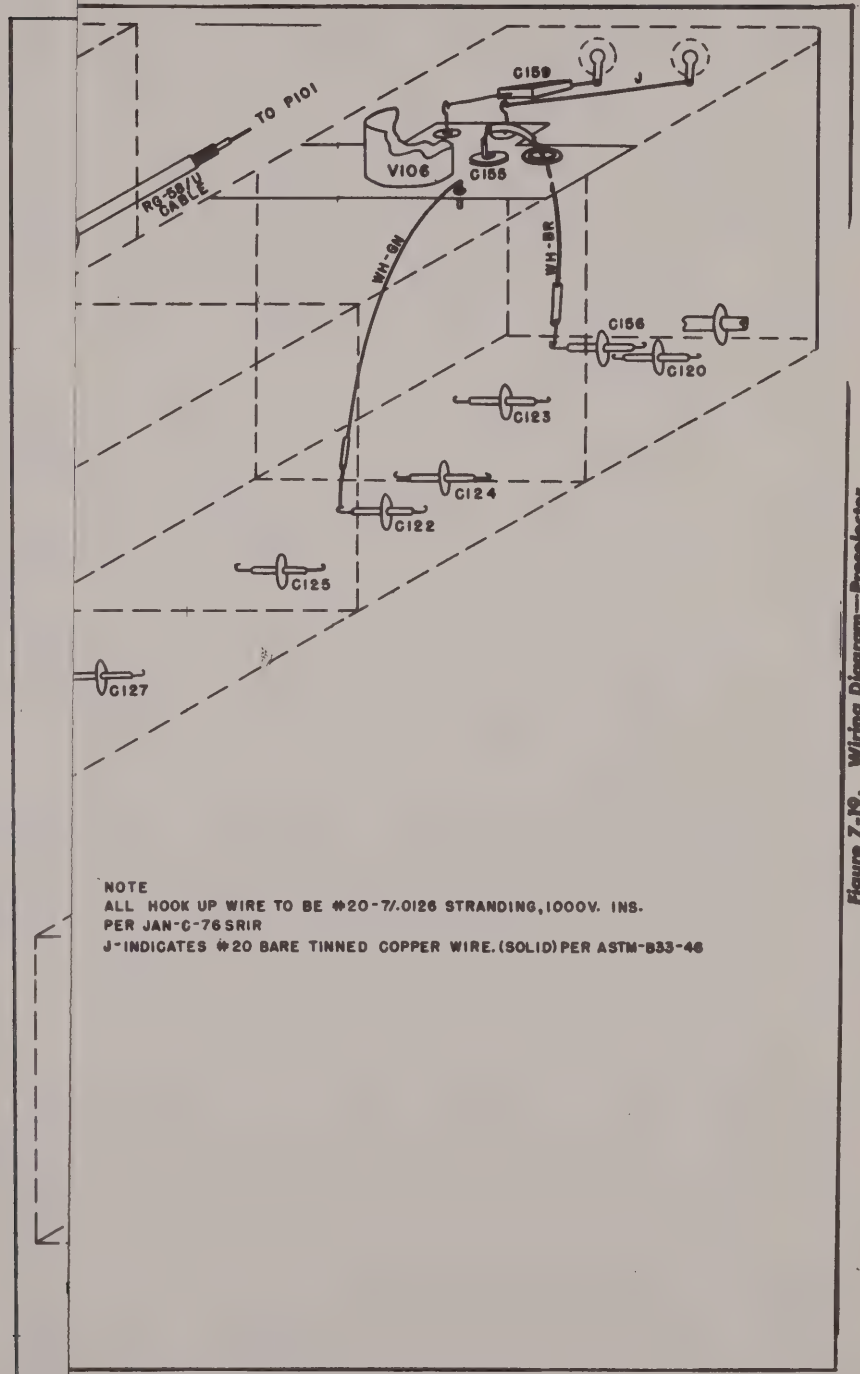


Figure 7-19. Wiring Diagram—Presector

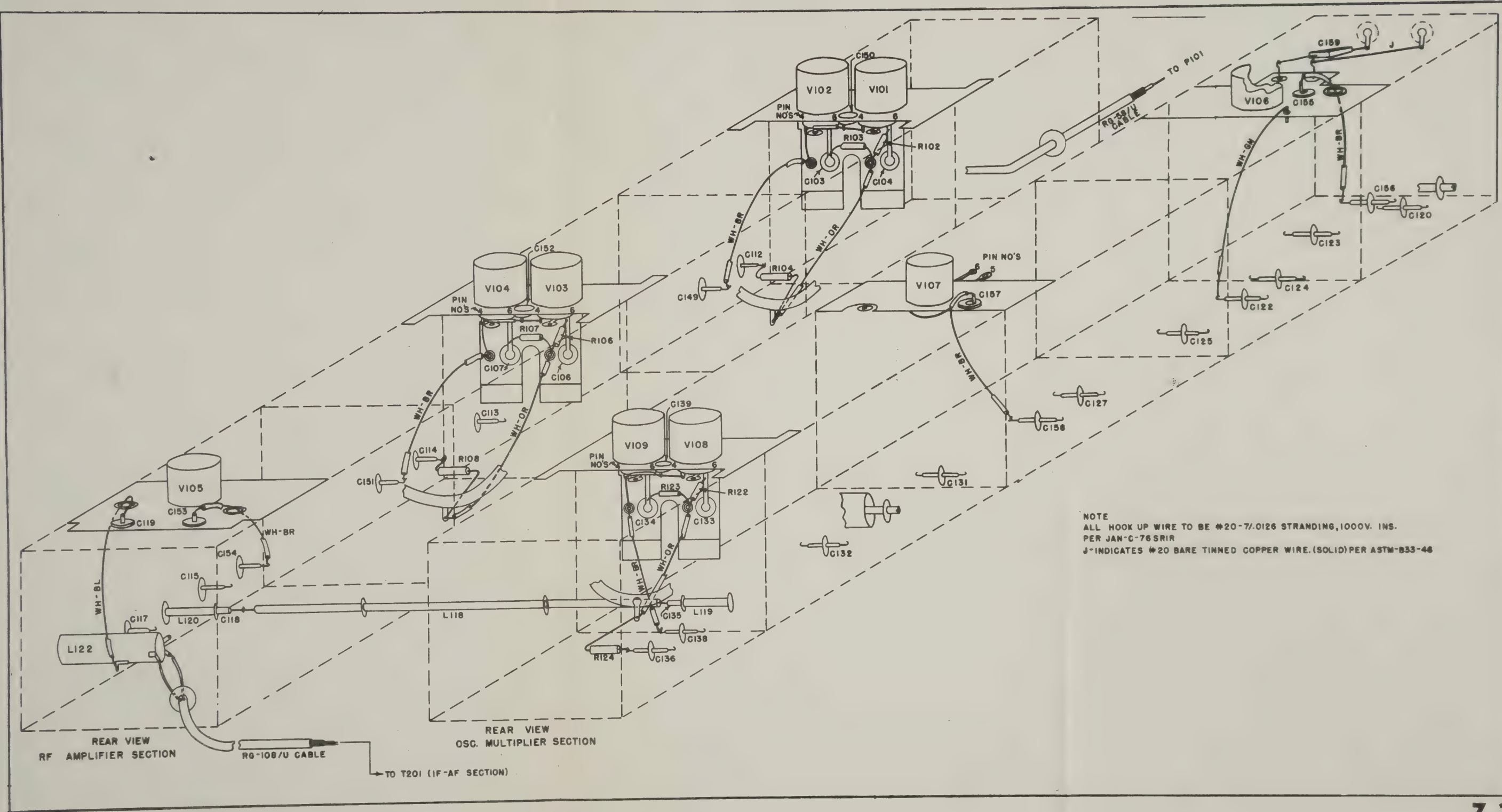


Figure 7-19. Wiring Diagram—Presetector

SECTION 8
PARTS LISTS AND
MISCELLANEOUS TABLES

TABLE 8-1. WEIGHTS AND DIMENSIONS OF REPAIR PARTS BOXES

EQUIPMENT REPAIR PARTS					
Repair Parts Box	Overall Dimensions			Volume (Cu. Ins.)	Weight (Lbs.)
	Height	Width	Depth		
# 1	6-1/8"	19"	10"	1164	23

TABLE 8-2. SHIPPING WEIGHTS AND DIMENSIONS OF REPAIR PARTS BOXES

The repair parts box is packed in the same shipping case with Radio Receiver R-266/URR-13, and the mounting brackets, plugs and instruction books comprised in Radio Receiving Set AN/URR-13. Shipping data for this crate is given in table 1-1. The manner in which this crate is packed is shown in figure 3-1.

TABLE 8-3. LIST OF MAJOR UNITS

Symbol Group	Quantity	Name of Major Unit	Designation
— 101-399, 501-599 401-499 —	1	Radio Receiving Set, including one Radio Receiver including one Band Suppression Filter	AN/URR-13 R-266/URR-13 F-89/URR-13
	1	Repair Parts Box	—

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

PARTS										Equipment Repair Parts	
Symbol Desig.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Item No.	Quantity	
Radio Receiving Set, AN/URR-13—Preselector											
C101	TUNER, rf: air dielectric; plate meshing type; 5 sections each 12.2 to 38.7 μ f; SLF characteristic; 0.020" air gap (plates in mesh); 10-11/32" lg x 4-19/32" h x 2-11/16" wd; shaft 1/4" diam x 1/2" lg beyond bushing; split stators and balanced grounded rotors; extens. shaft adjustment; 90 Invar plates w. copper + nickel + silver plating; 85.5° clockwise rotation; Mycalex insulation; solder lug terms.; 8 mtg holes (#6-32) on metal casting; includes 5 capacitor trimmers (C140-C144; 0.25-2.7 μ f each); also 5 inductors, fixed, L102A, L105B, L106C, L109D, L110E and 5 variable inductors, L103, L104, L107, L108, L111; tunes over 225-400 mc range	Tuning r-f amplr. section	(—484849)		CFT	FRA-5101-14 and FRE-21204-3 (outline)	C101	1			
C102	TUNER, r-f: air dielectric, plate meshing type; 4 sections: 43.5-14.3, 45.5-15, 43.4-14.3 and 35.2-12.2 μ f, split stators and balanced grounded rotors; SLF characteristic; 0.017" air gap, except 0.020" in tripler section (in mesh); 10-11/32" lg x 4-19/32" h x 2-11/16" wd; shaft 1/4" diam x 1/2" lg beyond bushing; bushing 1/2" diam. x 5/16" lg; extension shaft adjustment; 63 plates, all Invar with copper + nickel + silver plating except 1 brass plate in osc. section; 85.5° clockwise rotation; Mycalex insulation; solder lug terms.; 8 mtg holes (#8-32) in housing casting; includes 4 trimmer capacitors (C145-C148; 0.25-2.7 μ f each), 1 inductor fixed L113, and 4 inductors variable, L112, L114, L115, L117	Oscillator-Multiplier tuning	(—484850)		CFT	FRA-51201-14 and FRE-21203-3 (outline)	C102	1			
C103	CAPACITOR, fixed: silvered mica dielectric; 500 μ f, $\pm 10\%$; 500 vdcw; temp. coef., not limited; "button" type; 29/64" nom. diam. x 1/16" th. body; one 9/32" lg rt. angle solder lug term. (slotted); three 5/32" lg mtg tabs (grnd. contacts) spaced 120° apart. Per BuShips Spec. 16C41	Screen by-pass (1st, r-f amplr.)		N16-C-30167-1887	CER 370 CA	FRE-19952-1-1	C103, C104, C106, C107, C133, C134, C150, C139, C152	9			
C104	Same as C103	Screen by-pass (1st, r-f amplr.)									

C105	CAPACITOR, fixed; "Hi-K" ceramic dielectric; 1000 $\mu\mu\text{f}$ $\pm 20\%$; temp coef, 330 (± 500) $\mu\mu\text{f}/\mu\text{f}/^\circ\text{C}$; 500 vdcw; feed-thru-h style; body 5/8" lg x 5/16" betw flats of hex section; #12-28 x 9/32" lg mfg bushing (w parallel flats) and 5/32" x 5/16" hex nut; one #20 (0.032") x 1-1/4" lg axial wire lead each end	A. V. C. by-pass (1st, r-f amplr.)	(-484821-20)	N16-C-18659-4509	CER #362	FRE-19956-1-1	C105, C117, C112-C115, C122-C125, C120, C127, C131, C132, C136, C138, C149, C151, C154, C156, C158	21	1	5
C106	Same as C103	Screen by-pass (2nd r-f)								
C107	Same as C103	Screen by-pass (2nd r-f)								
C108	CAPACITOR, fixed; composition dielectric; 1-5 $\mu\mu\text{f}$, $\pm 20\%$; temp coef, 50 (± 50) $\mu\mu\text{f}/\mu\text{f}/^\circ\text{C}$; neg, 500 vdcw; body 0.230" lg x 0.160" diam; one #20 (0.032") x 1-1/2" lg axial wire lead each end	Coupling (1st r-f)		N16-C-55551-3119	CSA #GA-3	FRE-21182-1-2	C108, C109, C110, C111	4		
C109	Same as C108	Coupling (1st r-f)								
C110	Same as C108	Coupling (2nd r-f)								
C111	Same as C108	Coupling (2nd r-f)								
C112	Same as C105	Plate voltage by-pass (1st r-f)								
C113	Same as C105	A. V. C. by-pass (2nd r-f)								
C114	Same as C105	Plate voltage by-pass (2nd r-f)								
C115	Same as C105	Plate voltage by-pass (Mixer)								
C116	CAPACITOR, fixed; ceramic "Hi-K" dielectric; 1000 $\mu\mu\text{f}$ $\pm 10\%$; 350 vdcw; stand-off type; body, 0.320" lg x 1/4" betw. flats of hex section; one #20 (0.032") x 1-1/4" lg axial wire lead, one end, and #3-48 x 11/32" lg axial stud other end; unimulated. Capacity change $\pm 25\%$ to -50% over range -50°C to $+85^\circ\text{C}$.	Grid by-pass (Mixer)		N16-C-18657-8640	CER Type #720B	FRE-19954-1-1	C116, C160	2	2	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Drawing Symbol Number	Mfr. and Mfr's. Design.	Contract- or's Drawing and Part Number	All Symbol Design- ations Involved	Total No. Parts Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
C117	Same as C105	Plate by-pass (Mixer)								
C118	CAPACITOR, fixed: ceramic "Hi-K" di- electric; 18 μf , $\pm 5\%$; 500 vdcw; temp coef. -150 (± 250) $\mu\text{f}/\mu\text{f}/^\circ\text{C}$; 0.520" lg x 3/16" across flats of hex nut; axial wire lead at one end and axial #3-48 mtg. screw at other end; uninsulated	Link resonating (Mixer- Tripler)	(—484819-5-1/2	N16-C- 16051-3074	CER Type #721B	FRE- 19955-1-1	C118, C135	2	3	1
C119	CAPACITOR, fixed: silvered mica dielec- tric; 100 μf $\pm 5\%$; temp coef. zero (± 200) $\mu\text{f}/\mu\text{f}/^\circ\text{C}$; 500 vdcw; "button" type; 0.450" nom. diam. x 0.070" th. body; one 9/32" lg rt. angle lug terms (slotted); three 5/32" lg mtg. tabs (grnd. contacts) spaced 120°. Per BuShips spec. 16C41	Plate tank (Mixer)	(—CB11EG101J)	N16-C- 28553-1000	CER Type #600	FRE- 19953-1-1	C119	1		
C120	Same as C105	Plate volts by-pass (Osc. & 1st Dblr.)								
C121	CAPACITOR, fixed; ceramic dielectric; 15 μf $\pm 10\%$; temp coef neg. 220 (+60, —158) $\mu\text{f}/\mu\text{f}/^\circ\text{C}$; 500 vdcw; 0.562" lg x 0.250" diam; 2 axial wire leads; ceramic insulation; per Spec JAN- C-20	Osc. tank balancing	CC21RH150K	N16-C- 15997-1482			C121	1		
C122	Same as C105	Grid test point filter (1st Dblr.)								
C123	Same as C105	Plate by-pass (1st Dblr.)								
C124	Same as C105	Grid test point filter (2nd Dblr.)								
C125	Same as C105	Holding bias by-pass (2nd Dblr.)								
C126	CAPACITOR, fixed: ceramic dielectric; 10 μf , $\pm 1\mu\text{f}$; 500 vdcw; 0.562" lg x 0.250" diam; 2 axial wire leads; ceramic ins; Spec JAN-C-20	Grid tank balancing (2nd Dblr.)	CC21SL100F	16-C- 15933-7014			C126	2		

C127	Same as C105		Plate volts by-pass (2nd Dblr.)	CC21SL050F	N16-C- 15636-2514	C128	1	
C128	CAPACITOR, fixed: ceramic dielectric; 5 μ uf, $\pm 1 \mu$ uf; 500 vdw; temp coef $-330 (+500, -718) \mu$ uf/ μ f/ $^{\circ}$ C; 0.562" lg x 0.250" diam; 2 axial wire leads; ceramic ins; Spec JAN-C-20		Plate tank balancing (2nd Dblr.)					
C129	CAPACITOR, fixed; ceramic dielectric; 51 μ uf, $\pm 10\%$; 500 vdw; 0.562" lg x 0.250" diam; 2 axial wire leads; ceramic ins; Spec JAN-C-20		2nd dblr. coupling	CC21SL510K	N16-C- 16605-7014	C129, C130 C137, C216 C218	5	
C130	Same as C129		Coupling (2nd Dblr.)					
C131	Same as C105		Grid bias test point filter (Tripler)					
C132	Same as C105		Holding bias test point filter (Tripler)					
C133	Same as C103		Screen by-pass (Tripler)					
C134	Same as C103		Screen by-pass (Tripler)					
C135	Same as C118		Resonating link (Tripler- Mixer)					
C136	Same as C105		Plate volts by-pass (Tripler)					
C137	Same as C129		Oscillator coupling					
C138	Same as C105		Filament sup. by-pass (Tripler)					
C139	Same as C105		Filament by-pass (Tripler)					
C140	CAPACITOR, variable: (Integral with C101A)		Grid tank trimmer (1st r-f)					
C141	CAPACITOR, variable: (Integral with C101B)		Plate tank trimmer (1st r-f)					

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quantity
C142	CAPACITOR, variable: (Integral with C101C)	Grid tank trimmer (2nd r-f)								
C143	CAPACITOR, variable: (Integral with C101D)	Plate tank trimmer (2nd r-f)								
C144	CAPACITOR, variable: (Integral with C101E)	Grid tank trimmer (Mixer)								
C145	CAPACITOR, variable: (Integral with C102C)	Grid tank trimmer (Tripler)								
C146	CAPACITOR, variable: (Integral with C102D)	Plate tank trimmer (Tripler)								
C147	CAPACITOR, variable: (Integral with C102B)	Grid tank trimmer (2nd Dblr.)								
C148	CAPACITOR, variable: (Integral with C102A)	Plate tank trimmer (Oscillator)								
C149	Same as C105	Filament supply by-pass (1st r-f)								
C150	Same as C103	Filament by-pass (1st r-f)								
C151	Same as C105	Filament sup. by-pass (2nd r-f)								
C152	Same as C103	Filament by-pass (2nd r-f)								
C153	CAPACITOR, fixed: silvered mica dielectric; 500 $\mu\mu\text{f}$, $\pm 10\%$, temp coef, zero (± 200) $\mu\mu\text{f}/\mu\text{f}/^\circ\text{C}$; 500 vdcw; "button" type; 0.450" nom. diam. x 0.070" th. body; one 9/32" lg. rt. angle lug terms. (slotted); three 5/32" lg. mcg. tabs (grnd. contacts) spaced 120° C. Per BuShips spec 16C41	Filament by-pass (Mixer)	(—CB11EG501K)		CER Type #600	FRE-19953-1-2	C153, C155 C157	1		
C154	Same as C105	Filament sup. by-pass (Mixer)								

C155	Same as C153	Filament by-pass (Osc-Dblr.)	CM20D201J	N16-C- 29265-3006		C159	1		
C156	Same as C105	Filament sup. by-pass (Osc-Dblr.)							
C157	Same as C153	Filament by-pass (2nd Dblr.)							
C158	Same as C105	Filament sup. by-pass (2nd Dblr.)							
C159	CAPACITOR, fixed mica; 200 μf $\pm 5\%$; 500 vdcw; temp coef letter D; 51/64" lg x 15/32" wd x 7/32" thk; molded low loss bakelite case; 2 axial wire leads; per Spec JAN-C-5	Crystal leads resonating							
C160	Same as C116	D. C. block- ing							
L101	COIL, r-f; antenna coupling; 90° elbow; 3/16" OD x 0.025" wall S.D. seamless round copper tubing (0.0005" silver plate) bent on 1/4" radius (inside); one end flared to 9/32" diam; 31/32" o. a. l. to flared end; 1-3/64" o. a. l. to plain end	Antenna coupling		N16-S- 32841-1004	CFT	L101	1	FRB- 10086-1	
L102	INDUCTOR: (Integral with C101A)	Grid tank (1st r-f)							
L103	INDUCTOR: (Integral with C101A)	Grid tank trimmer (1st r-f)							
L104	INDUCTOR: (Integral with C101B)	Plate tank trimmer (1st r-f)							
L105	INDUCTOR: (Integral with C101B)	Plate tank (1st r-f)							
L106	INDUCTOR: (Integral with C101C)	Grid tank (2nd r-f)							
L107	INDUCTOR: (Integral with C101C)	Grid tank trimmer (2nd r-f)							
L108	INDUCTOR: (Integral with C101D)	Plate tank trimmer (2nd r-f)							
L109	INDUCTOR: (Integral with C101D)	Plate tank (2nd r-f)							
L110	INDUCTOR: (Integral with C101E)	Grid tank (Mixer)							
L111	INDUCTOR: (Integral with C101E)	Grid t. alk trimmer (Mixer)							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
L112	INDUCTOR: (Integral with C102D)	Plate tank trimmer (Tripler)								
L113	INDUCTOR: (Integral with C102D)	Plate tank (Tripler)								
L114	COIL, rf; oscillator; 1 wdg., single layer wound; unshielded; 1-25/32" lg x 17/32" wd; ceramic form; powdered iron core with slotted brass shaft for screwdriver adjust- ment of permeability; two #4-40 mtg. holes in base; 2 solder lug terms; and wire loop at tap. For winding data see table 7-8	Oscillator plate tank		N16-C- 76358-3376	CFT	FRA- 18729-2	L114	1		
L115	TRANSFORMER, rf; 40-70 mc freq. range; 2 space-wound, single layer wdgs wound as double helix on mica-filled Bakelite form; adjustable (screwdriver) powdered iron core for permeability tuning; un- shielded; 1-51/64" h x 1-1/16" wd x 9/16" d, excl. terms. & shaft; 2 #4-40 mtg. holes on 3/4" ctrs. in base flanges; 3 solder lug terms & 1/2" lg hex post term. at ends of wdgs.; formed loop for connec. to tap; for winding data see table 7-8	R-f trans- former (1st Dblr.)	(—472312)	N17-T- 82216-1516	CFT	FRA- 18730-2	L115	1		
L116	COIL, r-f; choke; air core; single wdg. single layer wound on mica-filled phenolic form; 1-51/64" lg x 1-5/16" wd x 9/16" d; two #4-40 mtg. holes on 3/4" ctrs. in flanges of base; 2 solder lug terms one side; one 1/2" lg hex post term other side. For winding data see table 7-8	Plate (2nd Dblr.)	(—472311)	N16-C- 72749-4693	CFT	FRA- 18731-2	L116	1		
L117	COIL, r-f; choke; air core; single wdg., single layer wound on mica-filled Bakelite form; unshielded 1-51/64" h x 1-11/16" lg x 9/16" wd, excl. terms.; permeability tuned by screwdriver adjustment of brass slug core; 2 solder lug terms at coil ends; 2 #4-40 mtg holes on 3/4" ctrs. For winding data see table 7-8	Grid tank (Tripler)	(—472315)	N16-C- 76515-7826	CFT	FRA- 18732-2	L117	1		
L118	INDUCTOR, special; 3-3/16" length 0.140" OD coaxial cable; 0.032" diam. copper inner conductor; copper tube (0.0002" silver plate) outer conductor; polyethylene dielectric; insulation stripped 5/16" from each end	Coupling line (Tripler- Mixer)		N16-C- 71585-4777	Precision Tube Mfg. Co. PER FTRC Dwg.	FRB- 10087-1	L118	1		

L119	INDUCTOR, special 25/32" length 3/16" diam. brass rod with #10-32 x 13/32" lg thrd. one end & remainder turned to 0.150" diam; 1/32" wd x 1/16" d. screwdriver slot in thrded. end, & #3-48 x 3/8" d axial hole other end; all 0.0005" silver plate	Link stud (Tripler-Mixer)		N16-C-600701-118	CFT	FRB-18733-1	L119, L120	2	
L120	Same as L119	Link stud (Mixer-Tripler)							
L121	INDUCTOR, special: 1-1/4" length 3/16" diam brass rod with #10-32 x 7/16" lg thrd. one end & remainder turned to 0.150" diam; 1/32" wd x 1/16" d screwdriver slot in thrded. end, and 1/16" diam x 3/16" d axial hole in other end; also 1/16" diam x 0.075" d radial hole centered 1/16" from latter (unthrded) end; all 0.0005" silver plate	Antenna coupling stud		N16-C-600701-119	CFT	FRB-6204-1	L121	1	
L122	TRANSFORMER, IF: interstage; 18.6 mc; unshielded; 1-31/64" h x 1-1/16" lg x 9/16" wd excl. terms. & tuning slug; powdered iron core; pri. & sec. tuned by single tuning slug, two #4-40 mig holes, 3/4" ctrs; 4 solder lug terms. For winding data see table 7-8	Plate coil (Mixer)	(—472313)		CFT	FRA-18728-2	L122	1	
L123	COIL, r-f: choke; single wdg., single layer wound; unshielded; 1.2 μ h $\pm 5\%$ (absolute value); 11/64" diam x 1/2" lg excl. leads; 1-1/2" lg axial wire lead each end. For winding data see table 7-8	Heater-cathode capacity resonating		N16-C-72793-6430	CFT	FRA-20493-1	L123	1	
P101	CONNECTOR, receptable; coaxial; 1 round male contact; 1" lg x 1" wd x 0.958" h; per BuShips Dwg. RE49F488B	Antenna inter-unit connection	UG-347/U	N17-C-73408-7101	CARO #7250		P101, P201	2	
R101	RESISTOR, fixed; composition; JAN type RC10BF104K; 100,000 ohms $\pm 10\%$; 1/4 w; F characteristic; 0.406" lg x 0.170 diam; insulated; salt water immersion resistant; two axial wire leads; per Spec. JAN-R-11	AVC filter (1st r-f)	RC10BF104K	N16-R-50633-491			R101, R105, R109, R115, R118	5	
R102	RESISTOR, fixed; composition; JAN type RC20BF33K; 33,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec. JAN-R-11	Screen dropping (1st r-f)	RC20BF33K	N16-R-50417-811			R102, R103, R106, R107	4	
R103	Same as R102	Screen dropping (1st r-f)							
R104	RESISTOR, fixed; composition; JAN type RC30BF222K; 2200 ohms $\pm 10\%$; 1 w; F characteristic; 0.750" lg x 0.280" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec. JAN-R-11	Plate volts dropping (1st r-f)	RC30BF222K	N16-R-50013-231			R104, R108,	2	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Spec. Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. of Parts Equip.	Equipment Repair Parts	
									Item No.	Quantity
R105	Same as R101.	AVC (2nd r-f)								
R106	Same as R102.	Screen dropping (2nd r-f)								
R107	Same as R102.	Screen dropping (2nd r-f)								
R108	Same as R104.	Plate volts dropping (2nd r-f)								
R109	Same as R101.	Grid leak (Mixer)								
R110	RESISTOR, fixed; composition; JAN type RC20BF104K; 100,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion re- sistant; two axial wire leads; per Spec JAN-R-11	Plate dropping (Mixer)	RC20BF104K	N16-R- 50633-811			R110, R201, R205, R208, R211, R219, R228, R229,	8		
R111	RESISTOR, fixed; composition; JAN type RC20BF181J; 180 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Cathode (Oscillator)	RC20BF181J	N16-R- 49642-431			R111, R116	2		
R112	RESISTOR, fixed; composition; JAN type RC20BF100K; 10 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Damping (Oscillator)	RC20BF100K	N16-R- 49238-811			R112	1		
R113	RESISTOR, fixed; composition; JAN type RC30BF682K; 6800 ohms $\pm 10\%$; 1 w; F characteristic; 0.750" lg x 0.280" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Plate volts dropping (oscillator)	RC30BF682K	N16-R- 50202-231			R113, R125	2		
R114	RESISTOR, fixed; composition; JAN type RC10BF123K; 12,000 ohms $\pm 10\%$; 1/4 w; F characteristic; 0.406" lg x 0.170" diam; insulated; salt water immersion re- sistant; two axial wire leads; per Spec JAN-R-11	Grid Leak (1st Dblr.)	RC10BF123K	N16-R- 50309-491			R114, R117	2		
R115	Same as R101	Grid iso- lation (1st Dblr.)								

Section 8
R-116-V-106B

[illegible]

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

PARTS										Equipment Repair Parts	
Symbol Desig.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Item No.	Quantity	
V107A V107B V108 V109	Same as V105A, B TUBE, electron: JAN-6AK5 Same as V108	2nd doubler Tripler Tripler	JAN-6AK5	N16-T-56191-50			V108, V109 V208-V210	5			
RADIO RECEIVING SET AN/URR-13—IF/AF SECTION											
C201A C201B	CAPACITOR ASSEMBLY: stand-off type; consists of 2 fixed capacitors in common housing each 1000 μf $\pm 20\%$, "HIK" ceramic dielectric, 350 vdcw, internally grounded; body, 1-15/16" lg x 1/4" across flats of hex. section; single #4-40 x 5/16" lg. axial mtg. stud one end; radial wire leads 3/8" and 13/16" from stud end. Aver temp coef, zero (± 142) $\mu\text{f}/\mu\text{f}/^{\circ}\text{C}$	A.V.C. by-pass (1st I.F.) and-plate by-pass (1st I.F.)	—484832-20		CASU Type K1200	FRE-21184-1-1	C201, C202, C204-C210 C213, C214, C217, C221, C234 (parts A & B)	14	4	3	
C202A C202B	Same as C201A, B	Screen by-pass (1st I.F.) and-plate by-pass (1st I.F.)									
C203 C204A C204B	Not used Same as C201A, B	A.V.C. by-pass (2nd I.F.) and-Filament by-pass (2nd I.F.)									
C205A C205B	Same as C201A, B	Screen by-pass (2nd I.F.) and-plate by-pass (2nd I.F.)									
C206A C206B	Same as C201A, B	A.V.C. by-pass (3rd I.F.) and-Filter by-pass (3rd I.F.)									

C207A C207B	Same as C201A, B		Screen by-pass (3rd I.F.) -and- Plate by-pass (3rd I.F.) Screen supply by-pass -and- Plate supply by-pass A.V.C. by-pass (4th I.F.) -and- Filament by-pass (4th I.F.) Screen by-pass (4th I.F.) -and- Plate by-pass (4th I.F.)	N16-C-35622-5222	CM38B103K	C211, C212, C215, C220, C223, C225-C228, C230-C233	13	
C208A C208B	Same as C201A, B							
C209A C209B	Same as C201A, B							
C210A C210B	Same as C201A, B							
C211	CAPACITOR, fixed; mica; 10,000 μf ±10%; 300 vdcw; temp coef letter B; 53/64" lg x 53/64" wd x 11/32" thk; molded low loss bakelite case; 2 axial wire leads; per Spec JAN-C-5		Filter for input meter					
C212	Same as C211		Filter for input meter					
C213A C213B	Same as C201A, B		Cathode by-pass (5th I.F.) -and- Filament by-pass (5th I.F.) Screen by-pass (5th I.F.) -and- Plate by-pass (5th I.F.)					
C214A C214B	Same as C201A, B							
C215	Same as C211	Noise Limiter time constant						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

PARTS									
Symbol Desig.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Construc- tive Drawing and Part Number	All Symbol Desig. noting involved	Total No. Per Equip.	Equipment Repair Parts Item No. Quan- tity
C216	Same as C129	IF by-pass (2nd Detec)							
C217A C217B	Same as C201A, B	IF by-pass (2nd detec) -and- A.V.C. Diode Cathode by-pass A.V.C. Coupling							
C218	Same as C129								
C219	Not used								
C220	Same as C211	1st A.F. Coupling							
C221A C221B	Same as C201A, B	A.V.C. I.F. by-pass							
C222A C222B	CAPACITOR ASSEMBLY: p/o Radio Re- ceiving Set AN/URR-13; consists of 2 fixed capacitors ea 230,000 μ uf, + 20% -10%, in common metal housing; 600 vdcw; case 1-15/16" lg x 2" h max; spade mtg bracket type CP06SA4; per Spec JAN-C-25	A.V.C. time constant -and- Silencer amplifier plate A.F. by-pass	CP61B6EF-254V and (Bracket) CP06SA4	16-C- 53448-1001			C222A, B		
C223	Same as C211	Silencer amplifier grid A.F. by-pass							
C224	Not used								
C225	Same as C211	Silencer diode coupling							
C226	Same as C211	2nd A.F. amplifier coupling							
C227	Same as C211	2nd A.F. amplifier screen by-pass							
C228	Same as C211	A.F. output amplifier coupling							

C229	CAPACITOR, fixed: paper dielectric; 1.0 μ f, $\pm 20\%$ — 10%; 600 vdcw; hermetically sealed metal case; 1-15/16" wd x 1-3/8" lg x 2-3/16" h max; two solder lug terminals on top; no internal ground connections; spade mtg bracket type CP06SA6; per Spec JAN-C-25	Plate volts by-pass (A.F. output ampl.)	CP61B1EF105V	N16-C-48841-9593	CLF 3AG2	FRA-511-1	L201-L211	11	5	3
C230	Same as C211	Output meter filter								
C231	Same as C211	Output meter filter								
C232	Same as C211	Phone output filter								
C233	Same as C211	Phone output filter								
C234A C234B	Same as C201A	Filament by-pass (2nd Detec. & AVC diode)								
F201	FUSE, cartridge; 2 amp; 60 min blowing time at 135% load; 250 v; one-time; glass tube body; ferrule terminals; 1-1/2" lg x 1/4" diam overall; type RE28F120	A-c power	RE28F120 (—28032-2)	N17-F-16302	CLF 3AG2		F201, F202, F203	3		
F202	Same as F201	A-c power								
F203	Same as F201	Spare								
L201	COIL, r-f; choke; single wdg, single layer; unshielded; 3 μ hys $\pm 5\%$ (absolute); untuned; one 1-1/2" lg axial wire lead each end	Filament Choke (1st I.F.)		N16-C-72909-4533	CFT		L201-L211	11	5	3
L202	Same as L201	Filament Choke (2nd I.F.)								
L203	Same as L201	Filament Choke (3rd I.F.)								
L204	Same as L201	Filament Choke (4th I.F.)								
L205	Same as L201	Filament Choke (5th I.F.)								
L206	Same as L201	Filament Choke (2nd Detec. & A.V.C. Diode)								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	PARTS					Equipment Repair Parts	
			JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Item No.
L207	Same as L201	Filament Choke (2nd Detec. & A.V.C. Diode)							
L208	Same as L201	(Output meter) filter choke							
L209	Same as L201	(Output meter) filter choke							
L210	Same as L201	(Phone output) filter choke							
L211	Same as L201	(Phone output) filter choke							
P201	Same as P101	Scan output interunit connection							
R201	Same as R110	A.V.C. filter (1st I.F.)							
R202	RESISTOR, fixed; composition; JAN type RC20BF510J; 51 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	cathode output 1st I.F.	RC20BF510J	N16-R-49444-431			R202	1	
R203	RESISTOR, fixed; composition; JAN type RC20BF272K; 2700 ohms, $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Screen dropping (1st I.F.)	RC20BF272K	N16-R-50039-811			R203, R204, R206, R207, R209, R210, R215, R216, R218, R220,	10	
R204	Same as R203	Plate dropping (1st I.F.)							
R205	Same as R110	A.V.C. filter (2nd I.F.)							

[illegible]

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Design- ations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
R221	RESISTOR, fixed; composition; JAN type RC20BF105K; 1 megohm $\pm 10\%$ 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	N.L. time constant	RC20BF105K	N16-R- 50975-811			R221,R223, R232,R242	4		
R222	RESISTOR, fixed; composition; JAN type RC20BF335K; 3.3 megohms, $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	N.L. buck- ing voltage coupling	RC20BF335K	N16-R- 51110-811			R222,R255	2		
R223	Same as R221	N.L. Diode load								
R224	RESISTOR, fixed; composition; JAN type RC20BF224K; 220,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	AF-2nd detector load	RC20BF224K	N16-R- 50714-811			R224	1		
R225	RESISTOR, fixed; composition; JAN type RC20BF154K; 150,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	AF-2nd detector load	RC20BF154K	N16-R- 50678-811			R225 R306	2		
R226	RESISTOR, fixed; composition; JAN type RC20BF153K; 15,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	AF-2nd detector load	RC20BF153K	N16-R- 50336-811			R226	1		
R227	RESISTOR, fixed; composition; JAN type RC20BF102K; 1000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	N.L. buck- ing voltage divider	RC20BF102K	N16-R- 49922-811			R227,R247	2		
R228	Same as R110	A.V.C. diode filter								
R229	Same as R110	A.V.C. diode load								
R230	RESISTOR, fixed; wire-wound; JAN type RU3B7R5J; 7.5 ohms $\pm 5\%$; 1/2 w; F characteristic; 21/32" lg x 15/64" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-184	Fixed bias supply	RC3B37R5J	N16-R- 68307-6666			R230	1		

R231	RESISTOR, fixed; composition; JAN type RC20BF155 K; 1.5 megohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer amplr. grid filter	RC20BF155K	N16-R-51020-811			R231, R251	2	
R232	Same as R221	1st AF grid							
R233	RESISTOR, variable; composition, 10,000 ohms, $\pm 10\%$; 2 watt, linear taper; case, 1-1/16" diam x 9/16" d; 3/8"-32 x 3/8" lg. mtg. bushing; slotted shaft 1/4" diam x 1/8" lg. beyond bushing; no off position; 3 radial solder lug terms.	Silencer control	(-636557-K10)	N16-R-87679-4320	CBZ U1031- SD3032	FRE- 2529-3-4	R233	1	
R234	RESISTOR, fixed; composition; JAN type RC20BF154J; 150,000 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer amplr. screen dropping	RC20BF154J	N16-R-50677-431			R234	1	
R235	RESISTOR, fixed; composition; JAN type RC20BF473J; 47,000 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer amplr. load	RC20BF473J	N16-R-50479-431			R235	1	
R236	RESISTOR, fixed; composition; JAN type RC20BF274K; 270,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer diode d-c coupling	RC20BF274K	N16-R-50741-811			R236, R240, R243	3	
R237	RESISTOR, fixed; composition; JAN type RC20BF273K; 27,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	1st AF plate dropping	RC20BF273K	N16-R-50399-811			R257	1	
R238	RESISTOR, variable; composition 40,000 ohms, $\pm 10\%$; 1/3 watt; CIR type "G" taper; resis. incr. w. clockwise rotation; 1-1/8" diam. x 17/32" d phenolic case w. metal cover; 3/8"-32 x 3/8" lg. mtg. bushing; 1/4" diam. x 1/8" (beyond bushing) lg. slotted shaft; 3 radial solder lug terms; stops at 3 and 9 o'clock	AF line level control	-637008-K10	N16-R-87808-4304	CIR	FRE- 19471-3-1	R238	1	
R239	RESISTOR, fixed; composition; JAN type RC20BF34J; 330,000 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer diode d-c coupling	RC20BF34J	N16-R-50758-431			R239	1	
R240	Same as R236	2nd AF grid							
R241	RESISTOR, fixed; composition; JAN type RC20BF821K; 820 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	2nd AF cathode	RC20BF821K	N16-R-49877-811			R241	1	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Desig.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contract- or's Drawing Part Number	All Symbol Designa- tions Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
R242	Same as R236	2nd AF screen dropping plate								
R243	Same as R221	2nd AF plate								
R244	RESISTOR, fixed; composition; JAN type RC20BF474K; 470,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion re- sistant; two axial wire leads; per Spec JAN-R-11	AF output amplr. grid	RC20BF474K	N16-R- 50822-0811			R244	1		
R245	RESISTOR, fixed; composition; JAN type RC20BF271K; 270 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	AF output amplr. cathode	RC20BF271K	N16-R- 49688-811			R245	1		
R246	RESISTOR, fixed; composition; JAN type RC20BF184J; 180,000 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	AF negative feedback	RC20BF184J	N16-R- 50695-431			R246, R253	2		
R247	Same as R227	AF output amplr. plate dropping								
R248	RESISTOR, fixed; wire-wound; JAN type RU3B150J; 15 ohms $\pm 5\%$; 1/2 w; 21/32" lg x 15/64" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-184	Delay bias	RU3B150J	N16-R- 68320-9426			R248	1		
R249	RESISTOR, fixed; composition; JAN type RC20BF472K; 4700 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Input meter balancing	RC20BF472K	N16-R- 50129-0811			R249	1		
R250	RESISTOR, fixed; composition; JAN type RC20BF474J; 470,000 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Voltage divider	RC20BF474J	N16-R- 50821-431			R250	1		
R251	Same as R231	Silencer amplr. grid filter								
R252	RESISTOR, fixed; composition; JAN type RC20BF821J; 820 ohms $\pm 5\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Silencer amplr. cathode bias	RC20BF821J	N16-R- 49876-431			R252	1		

R253	Same as R246	Voltage divider	(—636009-K10)	N16-R-88009-4390	CBZ U2041-SD4040L	FRE-2529-3-5	R254	1		
R254	RESISTOR, variable; composition; 200,000 ohms, $\pm 10\%$; 2 watt; linear taper; case, 1-1/16" diam. x 9/16" d; 3/8"-32 x 1/2" lg. mtg. bushing; slotted shaft 1/4" diam x 1/8" lg. beyond bushing; 3 radial solder lug terminals	Silencer adjustment								
R255	Same as R222	Voltage divider								
S201	SWITCH, toggle; SPDT; 3 amps, 125 v; with hex nuts and locking ring. Per JAN-S-23	Align-Rec.	ST12D	N17-S-72018-7719			S201, S202, S501	3		
S202	Same as S201	Noise limiter ON-OFF								
S203	SWITCH, rotary; 2 pole, 2 position; single section; silver plated brass contacts (shorting type) on 7/32" th ceramic wafer; 1-7/8" lg. x 1-1/2" wd x 1-1/16" d excl. bushing; three 3/16" solder lug terminals on rear; 3/8"-32 x 3/8" lg. bushings; 1/4" diam. x 3/8" lg. shaft	CRYSTAL-LC frequency control		N17-S-59261-8262		FRE-20323-1	S203	1	6	1
T201	TRANSFORMER, IF; 18.6 mci; 1st IF stage; shielded; 1-1/8" x 3" h, excl. terms.; powdered iron core (adjustable); tuned sec. (100 μ mf, mica, fixed); 4 solder lug terms; 2 #6-32 mtg. studs at bottom. Per FTRC Spec RC-7804-1. For winding data see table 7-8	1st I.F.		N17-T-68163-6426		FRE-20810-3-2	T201	1	7	1
T202	TRANSFORMER, IF; 18.6 mci; 2nd IF stage; shielded; 1-1/8" sq. x 3" h, excl. terms.; powdered iron core (adjustable) tuned pri and tuned sec. (each 100 μ mf, mica, fixed); 4 solder lug terms; 2 #6-32 mtg. studs at bottom. Per FTRC Spec RC-7804-1. For winding data see table 7-8	2nd I.F.		N17-T-68163-6451		FRE-20810-3-1	T202-T206	3	8	1
T203	Same as T202	3rd RF								
T204	Same as T202	4th RF								
T205	Same as T202	5th RF								
T206	Same as T202	2nd detector								
T207	TRANSFORMER, AF; plate coupling; pri: 100,000 ohms impd., 710 ohms d-c resist., 15 hys, sec: 60 ohms impd, 3.3 ohms d-c resist., silicon steel core; steel enclosing frame; 3" h x 1-5/8" sq.; turns ratio, 12.4:1; freq. response, ± 2 db, 350-3500 cps; electrostatic shield betw. wdgs, 5 ceramic-insulated solder terms. on bottom of case; two #6-32 mtg studs on 1-19/32" ctrs.; hermetically sealed. Per FTRC Spec. RC-7898-1. For winding data see table 7-8	AF output		N17-T-65494-3101		RC-7899-1	T207	1		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

P A R T S										Equipment Repair Parts	
Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr.'s Design.	Contract- or's Drawing and Part Number	All Symbol Design- ations Involved	Total No. Per Equip.	Item No.	Quan- tity	
V201	TUBE, electron: JAN-6BA6	1st I.F. and scan channel amplr.	JAN-6BA6	N16-T- 56211			V201	1			
V202	Same as V101	2nd I.F. amplr.									
V203	Same as V101	3rd I.F. amplr.									
V204	Same as V101	4th I.F. amplr.									
V205	Same as V101	5th I.F. amplr.									
V206A V206B	TUBE, electron: JAN-6AL5	2nd detector and A.V.C.	JAN-6AL5	N16-T- 56195-50			V206A,B V207A,B	2			
V207A V207B	Same as V206A, B	N.L. and silencer									
V208	Same as V108	Silencer amplifier									
V209	Same as V108	1st AF amplr.									
V210	Same as V108	2nd AF amplr.									
V211	TUBE, electron: JAN-6AK6	AF output amplr.	JAN-6AK6	N16-T- 56192			V211	1			
Y201	CRYSTAL, quartz: 5th mode. An type CR-24/U (NOT FURNISHED)	Oscillator control	CR-24/U ~				Y201	1			
Z201	FILTER, bandpass: bandspread, 350-3500 cps; peak freq. 1925 cps; response, ± 2 db, within bandspread; 2-3/4" wd. x 1-3/4" d. x 4-1/2" h, overall; output impeds.; 10,000 & 40,000 ohms; rectangular metal case, hermetically sealed; three 1/2" lg. insulated solder terms. on bottom; 4 #6-32 mtg. holes on 2-1/32" & 1-1/32" ctrs. Per FTRC Spec. RC-7902-1	AF bandpass filter		N16-F- 32171-3630		RC-7903-1	Z201	1			

	RADIO RECEIVING SET, AN/URR-13	POWER	SUPPLY SECTION			
BL301	Cabinet cooling	N17-B-21188-107 ²	CARB Type J-50C	FRE-20311-2	BL301	1 9 1
C301	Filter	CE41B350Q	N16-C-19892-7801		C301,C303	2
C302	Filter					
C303	Filter					
C304	Motor phasing					
L301	Filter		N16-R-29693-119	RC-8113-1	L301	1
P301	Power and audio input	(-491873)	N17-C-73487-7175	CARO #7450-S-1 (Base) and #7455 (Shell)	P301	1
R301	Negative supply	RC30BF220K	N16-R-49320-231		R301	1
R302	Bleeder	RC40BF821K	N16-R-49878-551		R302,R303, R309	3
R303	Bleeder					

BLOWER, air; centrifugal vane; 10 cfm. at 3300 rpm; direct drive, clockwise rot (viewed from motor end); horiz. oper.; outlet (1-11/64" diam. opening) toward right, at top; plastic housing; 3 mtg. bolts, 120° apart on 3/8" rad from center; motor 115 v (0.11 amp), 50/60 cps, 1 phase, 2700/3300 rpm, capacitor run, replaceable ball bearings; 3-17/32" wd x 3-43/64" h x 4-1/8" d, overall

CAPACITOR, fixed; dry electrolytic; dielectric, 35 μ f, $\pm 25\%$ —10%; 400 vdcw; operating temp range —20° C to +85° C; 3-5/8" diam; tubular metal case; 2 solder lug terms on bottom of case; terms insulated from can; mtg hex nut 7/8-16" thd 7/8" ID w/lockwasher; per Spec JAN-C-62

Same as C229

Same as C301

Same as C229

REACTOR: filter choke; 12 hys (tap at 11.4% of total turns), 145 ma; 350 ohms d-c resist; 1600 v rms test; enclosed metal case, 2-11/16" lg x 2-9/16" wd x 2-3/16" h, excl. terms; 4 #8-32 x 7/16" lg. mtg. studs on 2" x 1-7/8" mtg. ctrs.; 3 ceramic-insulated lugs on bottom. For FTRC Spec. RC-8112-1. For winding data see table 7-8

CONNECTOR: receptacle; 2 piece thru-panel mtg. type; comprises (1) 3/16" th. phenolic base carrying 4 round male contacts in polarizing arrangement and (2) 1.350" diam. x 13/32" d aluminum shell with mtg. flange; shell flange & phenolic base each 1-3/4" lg x 1-1/2" wd with four 0.154" mtg. holes on 1-3/8" and 1-1/8" centers; requires 1.350" cutout and four 0.154" diam. mtg. bolt holes in panel; 1/2" lg. solder lug terms on rear. Contact ratings: 10 amp, 500 v.

RESISTOR, fixed; composition; JAN type RC30BF220K; 22 ohms $\pm 10\%$; 1 w; F characteristic; 0.750" lg x 5.280" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11

RESISTOR, fixed; composition; JAN type RC40BF821K; 820 ohms $\pm 10\%$; 2 w; F characteristic; 1.41" lg x 0.405" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11

Same as R302

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Part Stock Number	Mfr. and Mfg. Design.	Contract- Drawing and Part Number	All Symbol Design- ations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
R304	Not used									
R305	RESISTOR, fixed: composition; JAN type RC20BF683K; 68,000 ohms $\pm 10\%$; 1/2 w; F characteristic; 0.468" lg x 0.249" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Input meter balancing	RC20BF683K	N16-R-50552-811			R305	1		
R306	Same as R225	Neon lamp series								
R307	RESISTOR, fixed: composition; JAN type RC40BF751J; 750 ohms $\pm 5\%$; 2 w; F characteristic; 1.41" lg x 0.405" diam; insulated; salt water immersion resistant; two axial wire leads; per Spec JAN-R-11	Regulator series dropping	RC40BF751J	N16-R-49859-171			R307, R309, R310	3		
R308	Same as R307	Regulator series dropping								
R309	Same as R302	Regulator series dropping								
R310	Same as R307	Regulator series dropping								
T301	TRANSFORMER, power: filament and plate type; 3 pri. and 4 sec. wdg; inputs: 110/115/120 v, 60 cps, 1 phase, 1 amp; outputs (sec'd.): (1) 6.3 v, C.T. 0.6 amp, (2) 5 v, 3 amp, (3) 6.3 v, 3.8 amp, (4) 470 v, C.T. 0.145 amp; no coolant, hermetically sealed metal case; 4-1/2" x 2-13/16" x 3-5/16" overall, not including terms; 14 ceramic-insulated 1/2" lg. terms on top of case; 4 #8-32 mtg. holes on bottom of case. Per FIRC Spec. RC-8114-1, and schematic dwg RC-8116-1. For winding data see table 7-8.	Filament and plate power		N17-T-74016-6329		RC-8115-1	T301	1		
S301	SWITCH, thermostatic: bimetal type; SPST NO; close at 120° F, $\pm 4^\circ$ F; 10° F oper. differential; 10 amps, 230 v; steel bracket type; 2-3/8" lg x 1-5/8" wd x 31/32" d. overall; one 5/32" diam. mt. hole 5/32" from each end on ctr. line; 2 screw terms.	Control for BL301		N17-S-69903-9979	CSQ C-4351-17	PRE-20497-1	S301	1	10	1
V301	TUBE, electron: JAN-5U4WG	Rectifier	JAN-5U4G					1		
V302	TUBE, electron: JAN-0B2	Voltage rectifier	JAN-0B2					1		

TUBE, electron: JAN-0A2	RADIO RECEIVING SET, JAN-0A2	Voltage rectifier	JAN-0A2	N16-T-52001	CSF #48P2	FRE-21181-1	C401, C402, C405, C406	1	11	2
CAPACITOR, fixed: paper dielectric; 0.25 μ f $\pm$ 20% —10%; 200 vdcw; hermetically sealed metal case; 1-13/16" lg x 3/4" diam; mineral oil filled and impregnated; #10-32 axial holes in ends are common terms, one term grnd'd internally; tan- genital mtg bracket w/0.201" mtg hole		A-c line filter	—484822	N16-C-46371-9609						
Same as C401		A-c line filter								
CAPACITOR, fixed: silvered mica dielectric; 1000 μ f $\pm$ 10%; 500 vdcw; temp coef letter C; button type 0.450" diam x 0.085" thk; metal case; one 9/32" lg rt angle lug term, slotted; 3 mtg tabs 5/32" lg x 1/16" wd, spaced 120° apart		A-c line filter	—484818-C10	N16-C-31090-3800	CER Type #600	FRE-19953-1-3	C403, C404, C407, C408	4		
Same as C403		A-c line filter								
Same as C401		Audio output filter								
Same as C401		Audio output filter								
Same as C403		Audio output filter								
Same as C403		Audio output filter								
Same as C403		Audio output filter								
CONNECTOR, male contact: Type AN-3102-14s-7P, 3 round male contacts; straight; 7/8-20 thd cylindrical metal body 3/4" diam x 35/64" lg excluding mtg; mtg flange 1-3/32" x 1-3/32" w/4 mtg holes .120" diam spaced 29/32"; per Spec AN-C-591		A-c power input	AN-3102-14s-7P	N17-C-72604-1516			J401	1		
CONNECTOR, male contact: Type AN-3102-14s-7P; 4 round male contacts; straight; 7/8-20 thd cylindrical metal body 3/4" diam x 35/64" lg excluding mtg; mtg flange diam x 1-3/32" x 1-3/32" w/4 mtg holes .120" diam spaced 29/32"; per Spec AN-C-591		Audio output	AN-3102-14s-2P				J402	1		
CONNECTOR, coaxial; Type -49194; 1 round female contact; straight; metal body 1-1/16" lg x 5/8" diam overall; thd sleeve w/2 hex nuts mtg; per BuShips Dwg. RF-49F-167-D		scan output	—49194	N17-C-73108-9753			J403	1		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quantity
J404	CONNECTOR, coaxial; Type UG-58/U (-49470); 1 round female contact; 1-1/8" lg x 1" diam overall; thd sleeve w/2 hex nuts mtg; w/shielding hood - Type UG-177/U; per BuShips Dwg. RE-49F-167-D; per Spec JAN-C-71	Antenna connection	UG-58/U (-49470), and type UG-177/U hood	N17-C-73109-4976 N17-C-945001-203 (Hood)			J404	1		
J405	CONNECTOR, plug; 4 round female contacts; straight type; 10 a., 500 v; cylindrical body, rectangular base; molded phenolic; 1-1/2" wd x 1-3/4" lg x 3/4" d excl. terms; four 0.189" diam. mtg. holes on 1-1/8" and 1-3/4" mtg ctrs; terms. silver plated & tin dipped. Mates with Navy -491873 (P301)	Power and audio input	(-491875)	N17-C-73194-4231	CARO #7450-S-2	FRE-21195-1	J405	1		
J406	CONNECTOR, coaxial; AN Type UG-348/U; 1 round female contact; straight; metal body 0.625" diam x 0.957" lg; mtg flange 1" x 1"; 4 mtg holds 0.125" diam spaced 0.718" c to c. per BuShips Dwg. RF49F488B	Scan output inter-unit connection	AN type UG-348/U	N17-C-73108-6037	CARO #7350		J406, J407	2		
J407	Same as J406.	Antenna inter-unit connection								
L401	COIL, r-f; filter choke; 1.26 mhy; 1.12 ohms d-c resia; 1.5 d-c amps; 400 v rms test; "Q"=25, $\pm 10\%$ at 225 kc; 4 μ mf $\pm 1 \mu$ mf distrib capac; 1-1/2" diam x 1-1/16" lg. incl. two rt. angle mtg. brackets on one end of tube; #6-32 mtg. holes (one each bracket) spaced 15/16" ctrs; 1 radial solder lug term. at each end of wdgs., on tube. For winding data see table 7-8	A-c line filter	(-304682)	N16-C-74458-4712	CFT	FRA-2698-1	L401, L402	2		
L402	Same as L401									
L403	COIL, r-f; filter choke; 0.339 mhy, $\pm 10\%$ at 10 mc and 20 mc; 2 amps d-c; 0.13 ohms d-c resia; "Q"=100 $\pm 10\%$ at 14 mc; single wdgs.; single layer wound; unshielded; 1-3/8" lg x 3/8" diam., excl. terms; single #6-32 x 5/16" deep axial mtg. hole; 2 solder lug terms, at ends of wdgs. For winding data see table 7-8	A-c line filter	(-472314)	N16-C-72730-3773	CFT	FRA-2720-1	L403, L404, L407, L408	4		
L404	Same as L403	A-c line filter								

L405	COIL, r-f: filter choke; 1.08 mh, $\pm 10\%$; no case; 1.96 ohms d-c resia; 300 dcma; 100 rms test; "Q" ≈ 30 , $\pm 10\%$, at 262 kc; 2 μmf ± 0.5 μmf distrib capacity; 1-3/16" wd x 1" d x 1-11/16" h incl. 2 rt. angle mtg. brackets on one end of tube; #6-32 mte. holes (one each bracket) spaced 15/16" on ctrs.; 1 radial solder lug term. at each end of wdg. on tube. For winding data see table 7-8	Audio output filter	(—304681)	N16-C-74411-7351	CFT	FRA-2699-1	L405, L406	2	
L406	Same as L403	Audio output filter							
L407	Same as L403	Audio output filter							
L408	Same as L403	Audio output filter							
P401	CONNECTOR, female contact: Type AN-3106-14S-7S; 3 round female contacts; straight; metal body 1-11/32" lg x 1-1/16" diam overall; 3/4-20 thd sleeve; includes soldering ferrule and cable clamp AN-3057-6; u/w Navy type MCOS-2 cable Spec 15C1; per Aero Spec AN-C-591	AC power input	AN-3106-14S-7S	N17-C-70328-1515		FRA-24367-1-1	P401	1	
P402	CONNECTOR, female contact: Type AN-3106-14S-2S; 4 round female contacts; straight; metal body 1-11/32" lg x 1-1/16" diam overall; 3/4-20 thd sleeve; includes soldering ferrule and cable clamp AN-3057-6; u/w Navy type TTFHWA-1 cable Spec 15C1; per Aero Spec AN-C-591	Audio output	AN-3106-14S-2S	N17-C-70334-5429		FRA-24367-1-2	P402	1	
P403	CONNECTOR, coaxial; Type-49195; 1 round male contact; straight; metal body 1-9/16" lg x 3/4" diam overall; includes shielding hood; per BuShips Dwg. RE-49F-167D	Scan output cable	(—49195)	N17-C-71413-4752			P403	1	
P404	CONNECTOR, coaxial; Type UG-21B/U; 1 round male contact; straight; metal body 1-3/4" lg x 13/16" diam overall; per BuShips Dwg. RE-49F-402; per Spec JAN-C-71	Antenna cable	UG-21B/U	N17-C-71416-2550	CARO 4300		P404	1	

Radio Receiving Set, AN/URR-13—Front Panel Section

I501	LAMP, incandescent: 6.3 v, 0.15 amps; bulb T-3-1/4" clear; 1-3/16" lg. overall; miniature s.c. bayonet base; C-2R filament; 3000 hrs.	Dial light	TB-14	N17-L-6297	CG #47	I501, I502	2	
I502	Same as I501	Dial light						
I503	LAMP, glow: 105-125 v, 1/25 watt; bulb T-3-1/4" clear; 13/32" diam. x 1-3/16" o.d.; miniature s.c. bayonet base	Crystal control operative		N17-L-6806-130	CG #NE-51	I503	1	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Desig.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contractor's Drawing and Part Number	All Symbol Designations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quantity
J501	JACK, telephone: short frame; tip and sleeves; per BuShips Dwg. RE49AA195; incl. hex nut, metal washer & phenolic washer. Receives Navy type #49109, 49106B or 49034 plug	Phone output	(—49025B)	N17-J-39248-4423			J501	1		
M501	METER, d-c milliammeter: scale, C-1; 105 ohms resis.; 2-1/2" diam. flush bakelite case w. special static shield, per CV dwg. #D-116402; per Spec JAN-1-6	Input meter	MR25W001-DCMA	N17-M-19255-1031	CV		M501	1		
M502	METER, volume level: scale, —10/0/+20; db; rectifier type; zero power level=6mv in 600 ohms; 2-1/2" diam. flush bakelite case w. spec. static shield per CV dwg. #D-116402	Output meter	(—22427)	N17-M-22724-6701	CV		M502	1		
R501	RESISTOR, variable: wire-wound; 50 ohms $\pm 10\%$; 2 w; 3 solder lug term; enclosed molded phenolic case; 0.62" thk x 1.28" diam; round metal shaft 0.250" ± 0.001 " diam x 1-1/2" lg from mtg surface; linear taper; insulated contact arm; normal torque; bushing 3/8"-32 x 3/8" lg; per Spec JAN-R-19	Dial lamp dimmer		N16-R-89956-7015			R501	1		
R502	RESISTOR, variable: composition; 1000 ohms, $\pm 10\%$; 2 watts; CBZ type A taper; metal case, 1-1/16" diam. x 9/16" deep; 3/8"-32 x 3/8" lg bushing; slotted shaft, 1/4" diam x 3/8" lg beyond bushing; 3 radial solder lug terms	Phone level adjust	(—637009-M10)		CBZ A1021- P3048	FRE-2529-3-1	R502	1		
S501	Same as S201	Silencer IN-OUT								
S502	SWITCH, toggle: DPST; JAN #ST-22K; 6 amps, 125 v; metal body 1-9/32" lg x 23/32" wd; 15/32-32 thd sleeve 1-5/8" lg w/2 hex nuts; 3 solder lug terms in rear; per spec. JAN-S-23	Power	ST-22K	N17-S-73082-9003			S502	1		
A-1	MOUNT, vibration; square mtg; 60-70 lb normal load rating; 3" sq x 1-1/2" h; wt 18 oz; rubber cushion; metal sleeve 0.328" ID (for 5/16" diam through-bolt); 4 mtg holes (0.255") in corners of base, spaced 2-1/2" on ctrs; metal cadmium plated to resist 200 hr. salt spray test	Shock absorption		N17-M-75268-6626	CAYU C-2070	FRE-8321-1	A-1	4		

A-2	SEAL, water: front panel seal (drip proof); extruded synthetic rubber, 45-55 Shore Durometer hardness; suitable for -20°C to +50°C ambient; irregular channel type cross-section, 29/64" x 15/16" overall; black; 400% elongation; 1200 psi tensile strength; permanent set 60%	Panel seal	N16-S-150263-107	FRE-4342-1	A-2	1		
E-1	BRUSH, electrical contact: #34 (.006") B & S ga hard (2 B & S nos) beryllium copper, heat treated for max spring properties, then silver plated; 0.312" wd x 0.455" o.a.l.; one end tapered symmetrically from point 0.237" from end, to width of 0.187" at end; #31 (.120") drill hole centered 0.156" from wide end; 70° angle	Sliding contact for inductance trimmers in C101, C101A-E, C102, C102-A-D	N17-B-86841-9339	FRE-5231-1	E-1	12		
E-2	CONTACT, case: 9/16" wd x 3/8" d x 3" lg rt angle section #14 (0.064") B & S ga 1/2-hard bronze sheet (.0006" nickel plate) with 4 #32 B & S ga hard beryllium copper spring inserts; 2 #30 (.128") mtg. holes spaced 1-1/2" on ctrs; one ass'y mtd vertically each side of chassis, at front edge	Grounding contact between receiver chassis and cabinet	N17-C-77415-7611	FRA-3079-1-1	E-2	2		
E-3	CONTACT, case: 9/16" wd x 3/8" d x 12" lg rt angle section #14 (0.064") B & S ga 1/2 hard bronze sheet (.0006" nickel plate) with 16 #32 B & S ga hard beryllium copper spring inserts; 7 #30 (.128") mtg holes spaced 1-1/2" on ctrs; one ass'y mtd top and bottom of chassis at front edge	Grounding contact between receiver chassis and cabinet	N17-C-77417-8070	FRA-3079-1-2	E-3	2		
E-4	CORE, adjustable tuning: #6-32 cadmium plated, brass stud imbedded, coaxially, in 0.309" diam x 3/8" lg cylinder of gray iron core material with 7/8" of stud protruding; 1-1/4" o.a.l.; 1/32" wd x 1/64" d diametral slot in end of core; 0.025" wd x 1/16" d slot in end of stud	Permeability tuning adjustment; used with L115 & L116	N16-C-600701-120	FRE-18772-1-1	E-4	2	15	1
E-5	CORE, adjustable tuning: #6-32 cadmium plated brass stud imbedded, coaxially, in 0.309" diam x 1/2" lg cylinder of gray iron core material with 7/8" of stud protruding; 1-5/8" o.a.l.; 1/32" wd x 1/64" d diametral slot in end of core; 0.025" wd x 1/16" d slot in end of stud	Permeability tuning adjustment; used with L114	N16-C-600701-121	FRE-18772-1-2	E-5	1	14	1
E-6	CORE, adjustable tuning: 5/16" diam x 1-3/8" lg brass rod turned to 0.309" diam for 1/2" from one end, and #6-32 x 7/8" lg third from other end; 1/32" wd x 3/64" d screwdriver slot in large end; 1/64" x 45° chamfer, and 0.025" wd x 1/16" d screwdriver slot in other end. All 0.0005" dull silver plate	Permeability tuning adjustment; used with L117	FRE-18771-1			1		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Design.	Name of Part and Description	Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Design.	Contract- or's Drawing end Part Number	All Symbol Design- ations Involved	Total No. Per Equip.	Equipment Repair Parts	
									Item No.	Quan- tity
E-7	HOLDER, fuse; extractor post type; (re- ceptacle plus cap); for type 3AG glass fuse; bakelite body; 2-13/32" lg x 25/32" diam overall; 8 amp, 125 v rating; 1/2" 24 x 1/2" lg bushing & 1/8" th x 11/16" (betw flats) hex nut for single hole panel mtg; 2 solder lug terms at rear	Holder for F201, F202 & F203		N17-F- 74266-9235	CFA type HKP	FRE- 1913-1	E-7	3		
E-8A E-8B	INSULATOR SET; cylindrical; comprising shoulder bushing E-8A and shoulder bush- ing E-8B; both natural paper base pheno- lic. First is 5/16" max OD x 0.101" (#38Dr) ID x 13/32" o.a.l. incl 0.185" diam x 1/32" d bushing at one end. Second is 5/16" max OD x 0.101" (#38 Dr) ID x 0.118" o.a.l. incl 0.185" diam x 1/40" d shank at one end	Crystal lead feed-through		N17-I- 81960-5263		(E-8A) FRE- 6784-1 and (E-8B) FRE- 6812-1	E-8A, E-8B			
E-9	INSULATOR, bushing; shoulder; natural mica-filled molded phenolic (JAN type MTS-E-3); 0.128" (#30 drill) ID x 1/2" max. OD x 7/16" o.a.l. incl undercut at one end, and recess in other; undercut, 0.373" diam x 1/16" d with parallel flats 0.124" each side of ctr; recess 0.031" deep w parallel sides 0.125" each side of ctr; sides of undercut parallel those of re- cess	Crystal clip insulator		N17-I- 49498-7025		FRP- 11108-1	E-9			
H-1	WASHER, spring; round; plane of washer bent on 13/16" radius to produce axial spring thrust; cadmium plated, type 3 spring steel, 0.016" th; 0.257" (F drill) ID x 7/16" OD x 0.047" th (incl spring curvature)	Thrust spring (capacitor shaft)		N43-W- 7520-2400	CAXO 3544-14	FRE- 10113-1	H-1			
H-2	TOOL, alignment; insulated; amber trans- parent molded thermoplastic; 4" o.a.l. x 5/16" betw flats of octagonal (maximum) cross-section; Tapered (round) to 1/4" diam at each end; 1/8" x 0.022" screw- driver tip molded into one end, and spline tip to fit #6 (American std) fluted socket- head cap screw molded into other end; Both tips from #303 stainless steel rod, annealed	Alignment		N16-T- 751468-732		FRA- 20347-1	H-2	1	13	1
O-1	DRIVE, dial: 1:20 speed reduction drive for preselector section, with automatic pre- cision stop effective at completion of 19th revolution of dial, in each direction; also dial lock; 3" wd x 5-3/8" lg x 2-1/16" d;	Preselector tuning drive (C101, C101A-E)		N16-D- 46576-1623		FRA- 2252-12 & (outline) FRA- 19967-2	O-1	1		

O-2	assy mtd on and between two #11 B & S ga type 52S 1/2-hard aluminum plates; dial calibrated 225-410 megacycles over 340.8° of circumference	Mounting for Y201	N17-C-804081-101	CFT	FRB-11107-1			
O-3	CLIP, crystal mounting: parallel grip for 0.062" diam wire terminal lead of type CR-24/U crystal; #28 (0.126") B & S ga hard (two B & S Nos) beryllium copper heat treated for maximum spring properties before plating (DWNP + silver); 13/16" lg x 0.248" wd x 3/16" d	Grounding clip for type CR-24/U crystal	N17-C-812323-101		FRB-11109-1	0-3		
O-4A O-4B	CLIP, grounding: #30 (0.010") B & S ga hard (two B & S Nos) beryllium copper, heat treated for max spring properties before plating; (DWNP + silver); 0.426" wd x 9/16" lg x 7/16" d COUPLING, flexible: comprises a driven arm (0-4A) with hub and a drive arm (0-4B) with hub; arms each #14 (0.064") B & S ga 1/2-hard nickel plated brass strip: Driven arm: 1/4" ID x 1/2" OD hub (w two #6-32 set screws) staked to radial arm carrying drive pin (parallel to and 1.344" from axis of hub); 1-25/32" x 9/16" x 19/32" Drive arm: 1/4" ID x 1/2" OD hub (w two #6-32 set screws) staked to radial arm slotted along ctr line to receive pin on drive arm; 1-13/16" x 9/16" x 11/32"	Coupling: dial drive to preselector assembly	N16-D-98378-2225		(0-4A) FRE-21220-1 FRA-21212-1 (0-4B) FRE-21221-1 FRE-21217-1	0-4A,B	1	
O-5	DRIVE, capacitor: comprising spur gear on short shaft supported in sand-cast aluminum alloy (Alcoa 195-T4) frame; Gear: 1.041" OD x 1.00" pitch diam x 48 diametral pitch x 0.187" th; involute teeth, 20° pressure angle; CR stainless steel; 1-2" OD x 0.2506" ID x 0.155" deep hub Bearing: oil-retaining; porous bronze Shaft: 1/4" diam x 1" lg with 1/32" x 45° chamfer; type 303 stainless steel Taper pin: #18-8 stainless steel; #5/0 x 1/2" lg 3-1/4" lg x 1-1/32" d x 1-9/16" h overall; three 0.189" diam holes in casting located in line and spaced 0.500" and 2.688" on centers	Synchronizing drive for oscillator & r-f tuning sections of preselector	N17-C-900151-109	CFT	FRE-21206-1 (outline) and FRA-7117-2	0-5	1	
O-6	BALL, locking: spherical; 1/8" diam, ±0.0001"; sphericity, 0.0001; type 440, grade 1, stainless steel hardened to Rockwell scale ("C" scale) value of 50-58	Inductance trimmer locking	77-B-999-75008-0100	Strom Steel Ball Co.	FRE-19584-1	0-6		
O-7	CLEANER ELEMENT, air: cartridge type; multiple baffles of aluminum screen wetted in oil; 3-1/2" h x 4" wd x 3/4" d; 0.032" gauge aluminum frame; cleaned with gasoline; rechargeable with SAE-#20 oil; unit supported against cabinet opening by external encasing frame containing pressure springs	Dust filter	N17-C-794001-133	CBEN R82A	FRE-20375-7	0-7	12	2

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Desig.	Name of Part and Description	PARTS					Equipment Repair Parts	
		Function	JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contract- or's Drawing and Part Number	All Symbol Design- ation Involved	Total No. Per Equip.
O-8	GEAR, spur; split-gear; spring-loaded, non-backlash type; 13/32" thick incl. hub; Gears (each section): #14 (0.064") S-T aluminum, 96 straight teeth; 48 diametral pitch, 20° pressure angle; 2" pitch diam Hub: 1/4" ID x 5/8" OD x 13/32" lg; incl 0.3745" diam x 0.093" lg, and 0.4994" diam x 0.068" lg shoulders for gears; two #6-32 radial set-screw holes 90° apart; Springs (2): 0.350" ID x 7/16" free length; compression; 7 turns #11 (.026") music wire; ends squared (rt or lt hand wound)	Preslector ganged capacitor drive		N16-C-432816-277		FRA-7189-1 and FRA-21207-1 (outline)	O-8	
O-9	CLAMP, tube; 3/8" wd x 0.025" th stainless steel (type 302) strap fitted with toggle clamp to form 1-3/8" ID (nominal) band; 1/2" wd x 3/4" & 3/8" lg L-shape mtg clip, having elongated (radially) hole for #10 mach screw, is soldered opposite clamp	Retainer for JAN type 5U4G tube (V301)	(—49680)	N16-C-13866-14	CAIS 926C	FRE-21201-1	O-9	
X-1	SOCKET, tube; miniature; 9 radial contacts spaced 36° apart; ceramic body, 0.859" diam (min) x 1.438" diam (max) x 0.393" d; two 0.145" diam (w parallel flats, each 1/16" from ctr) mtg holes spaced 1-1/8" on ctrs on long axis; 13/16" diam chassis cut-out required (under-chassis mtg); tin-plated phosphor bronze contacts	Receptacle for type GL-5670 tube (V106A, V106B)		N16-S-64061-6257	CNA per FTRC dwg	FRE-20948-1	X-1	
X-2	SOCKET, electron tube; miniature; 7 contacts (spaced 45°); molded plastic (type MTS-E-4 per JAN-P-14) body; axial solder-lug terms; 1-1/8" max diam x 11/32" d, excl 5/32" diam x 5/16" lg ctr shield extension; two 1/8" diam mtg holes spaced 7/8" ctrs on long axis. Per BuShips dwg RE49AA455A	Receptacle for JAN types 6BA6 (V201) 9003 (V202-V205), 6AL5 V206A,B & V207A,B, 6AK5 (V208-V210 and 6AK6 (V211) tubes	(—491675)	N16-S-62603-6446			X-2	
X-3	SOCKET, electron tube; miniature; 7 contacts (spaced 45°) ceramic body; solder terms; 1-1/8" max diam x 0.800" min diam x 1-9/32" o.a.l. Per JAN-S-28	Receptacle for JAN types 9003 (V101-V104), 6J6 V105A,B & V107A,B and 6AK5 (V108 & V109) tubes	SO-10-C	N16-S-62603-6676			X-3	

X-4	SOCKET, electron tube: 8 contact medium (d octal); ceramic body 1-1/4" diam x 1 1/2" d excl 11/32" phosphor bronze solder lug terms at rear; 2 #6-32 mtg holes spaced 1-5/8" on long axis of 1-3/8" min diam x 2" max diam stainless steel mtg plate	Receptacle for JAN type 5U4G (V301) tube	N16-S-63524-6475	CPH #49-RNSS8M	FRE-20179-1	X-4			
X-5	LAMPHOLDER: miniature, bayonet; 1/2" wd x 1-1/4" d x 1" h; #6-32 x 5/16" lg binding head screw in 90° angle bracket located beside socket shell; 2 solder-lug terms	Receptacle for lamps I501 and I502	N17-L-51624-6963	CAYZ 708 mod per FTRC dwg	FRE-2891-1	X-5			
X-6	LIGHT indicator: miniature, bayonet, s.c.; T-2 bulb; nickel plated brass shell; panel hole mtg; 13/16" max diam x 2-3/32" l- in-1 x 8" diam plastic head and 9/32" lg axial solder lug terms (2) at rear; bend protrudes 7/16" and has hemispherical (5/16" rad) end; shell threaded to form 11/16"-27 x 1/2" lg mtg bushing; hex nut, 3/32" th x 13/16" betw flats; lock-washer	Receptacle for type NE-51 neon lamp (I503)	N17-L-76743-3975	CAYZ PLN-850 mod. per FTRC dwg	FRE-1912-1	X-6			
	RADIO RECEIVER OSCILLATOR: Oscillator and 1st r-f doubler socket plate; includes capacitors C137, C155 & C160, inductor L123, resistors R111, R112, & R114-R116 and socket for V106; 1-1/2" wd x 2-15/32" lg x 1-3/8" d, overall; 4 open slots (0.130" wd) in ends of assembly plate for mtg screws located 11/16" and 2-5/16" on ctrs		N16-T-98591-1001	CFT	FRA-6770-2-2				
	RADIO RECEIVER SUB-ASSEMBLY: 2nd r-f doubler socket plate; includes capacitor C157 and socket for V107; 2-7/32" lg x 13/16" wd x 1-1/4" d; 4 open slots (0.130" wd) in ends of ass'y plate for mtg screws spaced 7/16" and 2-5/16" on ctrs		N16-T-98501-1002	CFT	FRA-6208-1-2				
	RADIO RECEIVER SUB-ASSEMBLY: r-f tripler socket plate and shield; includes capacitors C133, C134 & C139, resistors R122 & R123 and sockets for V108 & V109; 1-1/4" d x 2-1/2" wd x 3-1/4" h; 4 open slots in ends of ass'y plate for mtg screws spaced 7/16" and 2-5/16" on ctrs		N16-T-98501-1004	CFT	FRA-6200-2-2				
	RADIO RECEIVER PRESELECTOR: tunes over 225-400 mc range; includes r-f amplifier stages one side, and oscillator-multiplier stages on other; rectangular metal box, 4-7/8" wd x 6" h x 11-3/4" d, overall		N16-T-98077-4701	CFT	FRA-2857-14-2				
	RADIO RECEIVER AMPLIFIER: 1st r-f amplifier socket plate and shield; includes capacitors C103, C104 & C150, resistors R102 & R103 and sockets for V101 & V102; 1-1/4" d x 2-1/2" wd x 2-1/4" h; 4 open slots (0.130" wd) in ends of ass'y plate for mtg screws spaced 2-3/8" & 1" on ctrs		N16-T-98501-1003	CFT	FRA-4803-2-3				

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST

Symbol Desig.	Name of Part and Description	Function	PARTS						Equipment Repair Parts	
			JAN and (Navy Type) Number	Standard Navy Stock Number	Mfr. and Mfr's. Desig.	Contrac- tor's Drawing and Part Number	All Symbol Desig- nations Involved	Total No. Per Equip.	Item No.	Quan- tity
	RADIO RECEIVER AMPLIFIER: 2nd r-f amplifier socket plate and shield; includes capacitors C107, C106 & C152, resistors R106 & R107 and tube sockets for V103 and V104; 1-1/4" d x 2-1/2" wd x 2-1/4" h; 4 open slots (0.130" wd) in ends of ass'y plate for mtg screws spaced 2-3/8" & 1" on ctrs			N16-T- 98501-1003	CFT	FRA- 4803-2-4				
	RADIO RECEIVER SUB-ASSEMBLY: Mixer socket plate; includes capacitors C119 & C153 and socket for tube V105; 1-1/8" wd x 2-1/2" lg x 1-1/8" d; 4 open slots (0.130" wd) in ends of ass'y plate for mtg screws spaced 1 1/16" and 2-5/16" on ctrs			N16-T- 98501-1005	CFT	FRA- 9496-1-2				
	BOX, repair parts: Metal; per Navy spec. 42B9	Container for equip- ment repair parts								

TABLE 8-5. CROSS REFERENCE PARTS LIST

JAN (or AWS) Designation	Key Symbol	JAN (or AWS) Designation	Key Symbol	JAN (or AWS) Designation	Key Symbol
JAN-C-20		JAN-R-184		CAIS-49680	0-9
CC21RH150K	C121	RU3B7R5J	R230	CARO-491873	P301
CC21SL050F	C128	RU3B150J	R248	CARO-491875	J405
CC21SL100F	C126			-49194	J403
CC21SL510K	C129	JAN-S-28		-49195	P403
JAN-C-62		SO-10-C	X-3	CBZ-636123-K10	R214
CE41B350Q	C301			CIR-637008-K10	R238
JAN-C-5		JAN-S-23		CBZ-637009-M10	R502
CM20D201J	C159	ST-12-D	S201	TB-14	I501
CM35B103K	C211	ST-22-K	S502	CB11G101J	C119
		JAN-C-71		CB11G501K	C153
JAN-C-25		UG-21B/U	P404	Standard Navy Stock Numbers	
CP61B1EF105V	C229	UG-58/U	J404		
(Bracket CP06SA6)		UG-347/U	P101		
CP61B1EF503K	Not Used	UG-348/U	J406		
(Bracket CP61SA1)		JAN-1A		N16-C-13866-14	0-9
CP61B6EF254V	C222A, B	OA2	V303	N16-C-15636-2514	C128
(Bracket CP06SA4)		OB2	V302	16-C-15933-7014	C126
JAN-I-6		5670	V106A, B	N16-C-15997-1482	C121
MR25W001DCMA	M501	5U4WG	V301	N16-C-16051-3074	C118
JAN-R-19		6AK5W	V108	N16-C-16605-7014	C129
		6AK6	V211	N16-C-18657-8640	C116
RA20A1RD500AK	R501	6AL5W	V206A, B	N16-C-18659-4502	C105
(Except 3/4" shaft)		6BA6	V201	N16-C-19892-7801	C301
JAN-R-11		6J6	V105A, B	N16-C-28553-1000	C119
		9003	V101	N16-C-29265-3006	C159
RC10BF104K	R105	BuShips Spec. 16C44 (Ships)		N16-C-30167-1887	C103
RC10BF123K	R114			N16-C-31090-3800	C403
RC10BF393K	R121			N16-C-33622-5222	C211
RC10BF683K	R120			N16-C-46371-9609	C401
RC20BF100K	R112			N16-C-48841-9593	C229
RC20BF102K	R227			N16-C-53448-1001	C222A, B
RC20BF104K	R110			N16-C-55551-1925	C108
RC20BF105K	R221			N16-C-600701-118	L119
RC20BF122K	R119			N16-C-600701-119	L121
RC20BF153K	R226			N16-C-600701-120	E-4
RC20BF154J	R234			N16-C-600701-121	E-5
RC20BF154K	R225			N16-C-71585-4777	L118
RC20BF155K	R231			N16-C-72730-3773	L403
RC20BF181J	R111			N16-C-72749-4693	L116
RC20BF184J	R246			N16-C-72795-6430	L123
RC20BF223K	R122			N16-C-72909-4533	L201
RC20BF224K	R224			N16-C-74411-7351	L405
RC20BF271K	R245			N16-C-74458-4712	L401
RC20BF272K	R203			N16-C-76358-3376	L114
RC20BF273K	R237			N16-C-76515-7826	L117
RC20BF274K	R236			N16-D-46576-1623	O-1
RC20BF333K	R102			N16-D-900151-109	O-5
RC20BF334J	R239			N16-F-32171-3630	Z201
RC20BF335K	R222			N16-G-432816-277	O-8
RC20BF473J	R235			N16-R-20693-119	L301
RC20BF474K	R244			N16-R-49238-811	R112
RC20BF474J	R250			N16-R-49320-231	R301
RC20BF510J	R202			N16-R-49444-431	R202
RC20BF561K	R217			N16-R-49642-431	R111
RC20BF683K	R305			N16-R-49688-811	R245
RC20BF821J	R252			N16-R-49805-811	R217
RC20BF821K	R241			N16-R-49859-171	R307
RC30BF220K	R301			N16-R-49876-431	R252
RC30BF222K	R104			N16-R-49877-811	R241
RC30BF332K	R124			N16-R-49878-551	R302
RC30BF682K	R113			N16-R-49922-811	R227
RC40BF751K	R307			N16-R-49940-811	R119
RC40BF821K	R302			N16-R-50013-231	R104
				N16-R-50039-811	R203
				N16-R-50067-231	R124
				N16-R-50202-231	R113
				N16-R-50309-491	R114
				N16-R-50336-811	R226

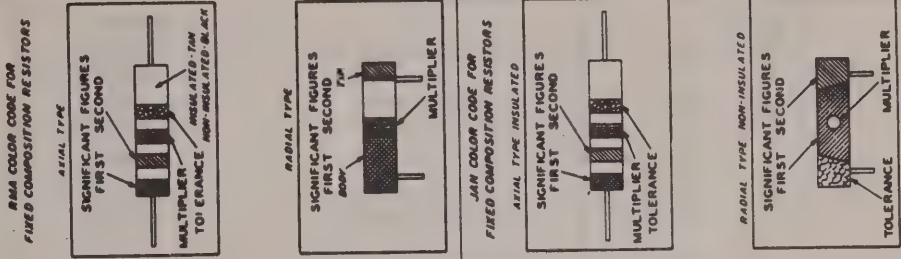
*Not furnished

TABLE 8-5. CROSS REFERENCE PARTS LIST

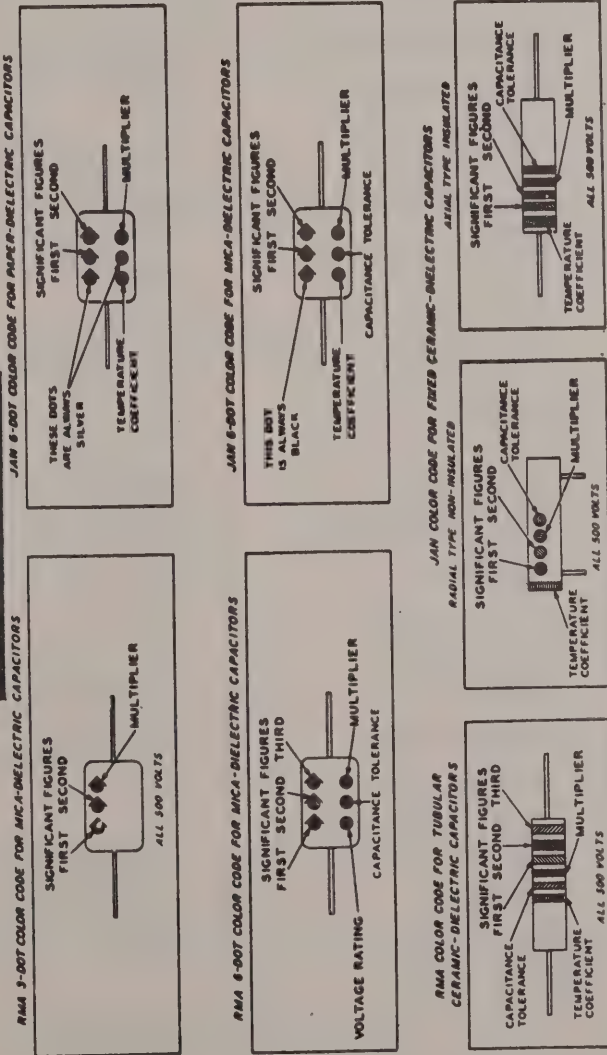
Standard Navy Stock Numbers	Key Symbol	Standard Navy Stock Numbers	Key Symbol	Standard Navy Stock Numbers	Key Symbol
N16-R-50372-811	R122	N16-S-150263-107	A-2	N17-C-73408-7101	P101
N16-R-50399-811	R237	N16-T-52001	V303	N17-C-73487-7175	P301
N16-R-50417-811	R102	N16-T-52001-05	V302	N17-C-77415-7611	E-2
N16-R-50444-491	R121	N16-T-52351	V106A,B	N17-C-77417-8070	E-3
N16-R-50479-431	R235	F16-T-55467	V301	N17-C-794001-133	O-7
N16-R-50552-491	R120	F16-T-56191-50	V108	N17-C-804081-101	O-2
N16-R-50552-811	R305	N16-T-56192	V211	N17-C-812323-101	O-3
N16-R-50633-491	R101	N16-T-56195-50	V206A, B	N17-C-98378-2225	O-4A
N16-R-50633-811	R110	N16-T-56211	V201	N17-F-16302	F201
N16-R-50677-431	R234	F16-T-56360	V105A, B	N17-F-74266-9235	E-7
N16-R-50678-811	R225	F16-T-79003	V101	N17-I-49498-7025	E-9
N16-R-50695-431	R246	N16-T-98077-2726	C102	N17-I-81960-5263	E-8A
N16-R-50714-811	R224	N16-T-98077-2751	C101	N17-J-38248-4423	J501
N16-R-50741-811	R236	N16-T-98077-4701	Sub-Assembly	N17-L-51624-6963	X-5
N16-R-50758-431	R239	N16-T-98501-1001	Sub-Assembly	17-L-6297	I-501
N16-R-50821-431	R250	N16-T-98501-1002	Sub-Assembly	17-L-6806-130	I503
N16-R-50822-0811	R244	N16-T-98501-1003	Sub-Assembly	N17-L-76743-3975	X-6
N16-R-50975-811	R221	N16-T-98501-1004	Sub-Assembly	N17-M-19235-1051	M501
N16-R-51020-811	R231	N16-T-98501-1005	Sub-Assembly	N17-M-22724-6701	M502
N16-R-51110-811	R222	N16-T-751468-732	H-2	N17-M-75268-6626	A-1
N16-R-68307-6666	R230	N17-B-21188-1075	BL-301	N17-S-39261-8262	S203
N16-R-68320-9426	R248	N17-B-86841-9339	E-1	N17-S-69903-9979	S301
N16-R-87519-4490	R214	N17-C-70328-1515	P401	N17-S-72018-7719	S201
N16-R-87679-4320	R233	N17-C-70334-5429	P402	N17-S-73082-9003	S502
N16-R-87808-4304	R238	N17-C-71413-4752	P403	N17-T-65494-3101	T207
N16-R-88009-4390	R254	N17-C-71416-2550	P404	N17-T-68163-6426	T201
N16-R-89956-7015	R501	N17-C-72604-1516	J401	N17-T-68163-6451	T202
N16-S-32841-1004	L101	N17-C-73108-9753	J403	N17-T-74016-6329	T301
N16-S-62603-6446	X-2	N17-C-73108-6037	J406	N17-T-82216-1516	L115
N16-S-62603-6676	X-3	N17-C-73109-4976	J404	N43-W-7520-2400	H-1
N16-S-63524-6475	X-4	N17-C-73194-4231	J405	77-B-999-75008-0100	O-6
N16-S-64061-6257	X-1				

TABLE 8-6. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

RESISTOR COLOR CODES



CAPACITOR COLOR CODES



RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS				CAPACITORS			
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING
1	1	0	BLACK	1	1	1	A
2	10	1	BROWN	10	10	10	B
3	100	2	RED	100	100	100	C
4	1000	3	ORANGE	1000	1000	1000	D
5	10000	4	YELLOW	10000	10000	10000	E
6	100000	5	GREEN	100000	100000	100000	F
7	1000000	6	BLUE	1000000	1000000	1000000	G
8	10000000	7	VIOLET	10000000	10000000	10000000	
9	100000000	8	GRAY	100000000	100000000	100000000	
5	0.1	9	WHITE	0.1	0.1	0.1	
10	0.01		SILVER	0.01	0.01	0.01	
20			NO COLOR				

TABLE 8-7. LIST OF MANUFACTURERS

Code Number	Prefix	Name	Address
1	CBZ	Allen Bradley Co.	118 West Greenfield Ave., Milwaukee 4, Wisconsin
2	CPH	American Phenolic Corp.	1830 South 54th Ave., Chicago 50, Illinois
3	CAYA	Barry Corp., L.N.	489 Main St., Cambridge, Mass.
4	CAIS	Birtcher Corp.	5087 Huntingdon Drive, Los Angeles, Calif.
5	CFA	Bussmann Mfg. Co.	2538 West University St., St. Louis 7, Missouri
6	CMG	Cinch Mfg. Co.	2335 West Van Buren St., Chicago 12, Illinois
7	CAYZ	Dial Light Corp.	900 Broadway, New York 3, N. Y.
8	CARB	Eastern Air Devices, Inc.	285 Dean St., Brooklyn 17, N. Y.
9	CASU	Electrical Reactance Co.	Franklinville, N. Y.
10	CER	Erie Resistor Co.	644 West 12th St., Erie, Pennsylvania
11	CFT	Federal Telephone & Radio Corp.	100 Kingsland Road, Clifton, N. J.
12	CG	General Electric Co.	1 River Road, Schenectady, N. Y.
13	CARO	Industrial Products Co.	Brookfield St., Danbury, Connecticut
14	CIR	International Resistance Co.	401 North Broad St., Philadelphia, Pa.
15	CLF	Littelfuse, Inc.	4765 No. Ravenswood Ave., Chicago 40, Illinois
16	CNA	National Co., Inc.	61 Sherman St., Malden, Mass.
17		Precision Tube Mfg. Co.	3828 Terrace St., Phila. 28, Pa.
18	CAXO	Shakeproof, Inc.	2573 N. Keeler Ave., Chicago 39, Illinois
19	CSQ	Spencer Thermostat Co.	34 Forrest St., Attleboro, Mass.
20	CSF	Sprague Electric Co.	201 Beaver St., North Adams, Mass.
21	CSA	Stackpole Carbon Co.	1942 Tannery St., St. Marys, Pennsylvania
22		Strom Steel Ball Co.	Cicero, Illinois
23	CV	Western Electrical Instrument Co.	614 Frelinghuysen Ave., Newark 5, N. J.
24	CBEN	Air-Maze, Inc.	5200 Harvard Ave., Cleveland 5, Ohio

INDEX

<i>Subject</i>	<i>Table (T) or Figure</i>	<i>Page</i>
A		
Air Filters.....	3-3	1-6, 6-3
Alignment.....		7-3
Alignment, I-f.....		
Bench set-up.....	7-3	
Procedure.....		7-3
Alignment, R-f.....		
Bench set-up.....	7-2	
Typical Voltage Readings.....	(T)7-1	
Adjustments.....	7-4, 7-8, 7-9	
Procedure (using crystals).....		7-4
Procedure (without use of crystals).....		7-6
Antenna.....		1-9, 1-12
Antenna Input.....		2-1
Audio Frequency Circuits.....	2-13	2-15
Audio Response Characteristic.....	7-5	7-6
Audio Test Data.....	(T)7-2	
AVC Rectifier Circuit.....	2-11	2-13
B		
Band Suppression Filter F-89/URR-13 (See "Cable Filter")		
Bias Voltage Supply.....	2-14	2-19
Block Diagram.....	2-1	
Blower BL301		
Description.....		2-19
Removal from chassis.....		7-7
Maintenance.....		6-3
C		
Cabinet		
Description.....		1-6
Removal of Chassis.....	5-1	3-3
Cable Filter		
Description.....	1-3, 1-11, 3-11	1-9, 2-1
Simplified Schematic.....	2-16	2-19
Cables		
Locations.....	3-4	
Method of Assembly.....	3-5, 3-6	
Replacement of.....		7-12
Details.....	7-10	
External.....	(T)3-2	
Capacitor C101 (R-f Amplifier Section).....	1-10	2-1
Capacitor C102 (Oscillator-Multiplier Section).....	1-9	2-7
Check Chart, Operational.....	(T)5-1	5-1
Check Chart, Maintenance.....	(T)6-1	6-3
Circuit Analysis.....		2-1

<i>Subject</i>	<i>Table (T) or Figure</i>	<i>Page</i>
Color Code.....	(T)8-6	
Connections, external.....	7-7	3-3, 6-3
Connectors.....		
Locations.....	3-4	
Method of Assembly.....	3-5, 3-6	
Details.....	7-11	
Supplementary.....	(T)3-2	2-1, 3-5
Contract Data.....		1-11
Controls, Location of.....	4-1	4-0
Corrections, Record of.....		"C"
Corrective Maintenance (Section 7).....		7-1
Cross-Reference Parts List.....	(T)8-5	
Crystal, CR-24/U.....		
Description.....		1-11
Frequencies.....		3-5, 3-6
Outline and Data.....	7-16	1-12
Use of during Manual Tuning.....		2-7
CRYSTAL-MANUAL Switch.....		4-0

D

Description (Section 1).....		1-1
Dial Drive Mechanism.....		
Description.....	1-5	1-7
Lubrication.....	6-1	6-3
Removal from Chassis.....		7-11
Details, and Automatic Stop Device.....	6-1	

E

Effective Pages, List of.....		"A"
Electrical Characteristics.....		1-11
Electron Tubes (See "Tubes").....		
Emergency Maintenance.....		5-1
Equipment Supplied.....	(T)1-1	1-3
Equipment Required but not Supplied.....	(T)1-2	1-3, 1-9

F

Failure Reports.....	7-1	vi
Filament and Heater Supply.....	2-14	2-19
First Doubler Circuit.....		2-9
First I-f Amplifier Circuit.....	2-7	2-9
First R-f Amplifier Circuit.....	2-2	2-5
Frequency Range.....		1-11
Front Panel Assembly.....	4-1	1-6
Fuse Information.....		5-1

	Subject	Table (T) or Figure	Page
C			v
	G		
	I		
Illustrations, List of			iii
Impedances			1-12
Inductance Trimmers		7-7	2-1
Initial Adjustment (Section 3)			3-1
Input Meter (M501) Circuit		2-9, (T)4-1	2-13, 4-1
Inspection			6-1
Installation Drawings		(T)3-1	3-1
Installation Record			vi
Installation (Section 3)			3-1
IF/AF Section			
Description		2-6A, 2-6B	1-9
Tube Socket Diagram		7-14	
I-f Amplifier Section			
Circuit		2-8	2-9
2nd, 3rd, 4th and 5th I-f Amplifiers		2-8	2-9
I-f Selectivity Characteristic		7-6	2-9
I-f Test Data		(T)7-3	
	L		
Locating the equipment			3-3
Lubrication			
Dial Drive Mechanism		6-1	6-3
Side Rails and Guide Pins			6-3
	M		
Maintenance, Corrective			7-1
Maintenance, Emergency			5-1
Maintenance, Operators			5-1
Maintenance, Preventive			6-1
Major Units		(T)8-3	
Manufacturers, List of		(T)8-7	
Mixer Stage Circuit			2-5
	N		
Naval Inspector			1-11
Noise Limiter Circuit		2-10	2-13, 4-1
	O		
Operation (Section 4)			
Modes of			4-0
Method of			3-5, 4-0
Operational Controls			4-0

<i>Subject</i>	<i>Table (T) or Figure</i>	<i>Page</i>
Operator's Maintenance (Section 5)		5-1
Oscillator Circuit		2-7
Oscillator-Multiplier Section	2-5	2-7
Outline Drawing (See List of Illustrations)		
Output of Receiver		1-12

P

Parts		
Ordering of		vi
Combined Parts and Repair Parts List	(T)8-4	
Cross Reference Parts List	(T)8-5	
Phones		1-9
Plugs, (See "Connectors")		
Power Requirements		1-12
Power Supply Section		
Description	2-15	1-9
Circuit	2-14	2-19
Bias Supply		2-19
Filaments Supply		2-19
Tube Socket Diagram	7-13	
Preselector		
Description	2-3, 2-4, 7-4,	
Circuits	7-8, 7-9	1-6
Outline	2-2, 2-5	2-1
Socket Plate Assemblies	3-10	
Tube Socket Diagram	1-7, 1-8	
Alignment of (See "Alignment")	7-12	
Removal from Chassis		7-11
Preventive Maintenance (Section 6)		6-1
Principles of Operation (Basic)		1-1
Promulgating letter		"B"

R

R-f Amplifier Section	2-2	2-1
Record of Corrections		"C"
Reference Data		1-11
Re-installation of Parts		3-3
Relay Rack Mounting	3-2	3-3
Relay Rack Mounting Brackets	3-7	3-3
Removal and Replacement of Parts		
Blower BL301		7-7
Blower Capacitor C304		7-7
Power Transformer T301		7-9
Dial Drive Assembly 0-1		7-11
Preselector		7-11

<i>Subject</i>	<i>Table (T) or Figure</i>	<i>Page</i>
Repair Parts List.....	(T) 8-1	
Repair Parts, weights.....	(T) 8-4	
Resistance and Voltage Measurements.....	(T) 7-5, (T) 7-6	7-1
Resuscitation.....		vii
Routine Maintenance Check Chart.....	(T) 6-1	6-3
Routine Operational Check Chart.....	(T) 5-1	5-1
"Ruggedized" Tubes.....		5-2
S		
Safety Notices.....		vii, 6-2, 7-1
Scan Circuit		
Description.....	2-7	1-9
Output.....		3-9
Schematics		
Overall.....	7-17	
Simplified (See List of Illustrations)		
Second Detector Circuit.....	2-10	2-13
Second Doubler Circuit.....		2-7
Second R-f Amplr. (Circuit).....		2-5
Shipping Data.....	(T) 1-3	1-3
Shock Mounts.....	1-2, 1-3	3-3
Silencer Circuit		
Theory of Operation.....	2-12	2-14
Panel Controls.....	4-1	4-0
Characteristics.....		1-12
Use of Circuit.....		4-1
Adjustment of Potentiometer.....		5-2
Socket Plate and Shield Assemblies.....	1-7, 1-8	
Spare Parts (See "Repair Parts")		
Speaker.....		1-9
Stability.....		1-12
T		
Tables, List of.....		iv
Theory of Operation (Section 2).....		2-1
Thermostat S301.....		2-19
Transmission Lines.....		1-9
Tripler Circuit.....		2-9
Trouble Shooting.....		7-1
Trouble Shooting Chart.....	(T) 7-4	
Tube Socket Diagrams		
Preselector.....	7-12	
IF/AF Section.....	7-14	
Power Supply Section.....	7-13	
Tubes		
Tube Complement.....	(T) 1-4	1-7

<i>Subject</i>	<i>Table (T) or Figure</i>	<i>Page</i>
Tube Characteristics.....	(T)7-7	
Tube Information.....		5-2, 7-1
Tube Checking.....		7-1
"Ruggedized" Replacements.....		5-2, 7-3
Tuning, Crystal Controlled.....		3-6, 4-0, 4-1
Tuning, Manually Controlled.....		3-9, 4-0, 4-1
Tropicalization.....		6-3
U		
Unpacking the Equipment.....	5-1	3-1
V		
Voltage and Resistance Measurements.....	(T)7-5	
Vacuum Tubes (See "Tubes")	(T)7-6, 7-15	
W		
Weights and Dimensions.....	(T)8-1	
Winding Data.....	(T)7-8	
Wiring Diagram		
Chassis.....	7-18	
Preselector.....	7-19	